OCT 25 1929

BULLETIN OF THE

TAYLOR SOCIETY

AN INTERNATIONAL SOCIETY TO PROMOTE THE SCIENCE
AND THE ART OF ADMINISTRATION AND OF MANAGEMENT

Incentive Wage Systems

By H. K. HATHAWAY

Testimony of Carl G. Barth Before the Special Committee of the House of Representatives, 1912

A Boston Section Symposium on the Older Worker in Industry

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OCTOBER, 1929 VOL. XIV, NO. 5

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2. To secure the gradual elimination of unnecessary effort and of unduly burdensome toil in the accomplishment of the work of the world.

3. To promote the scientific study and teaching of the principles governing organized effort, and of the mechanisms of their adaptations and application under varying and changing conditions.

4. To promote general recognition of the fact that the evaluation and application of these principles and mechanisms are the mutual concern of the community, the worker, the manager and the employer.

5. To inspire in labor, manager and employer a constant adherence to the highest ethical conception of their individual and collective responsibility.

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Published by the Taylor Society Incorporated at

Engineering Societies Building
29 West Thirty-Ninth St., New York
Cable address: Taysoc

The BULLETIN OF THE TAYLOR SOCIETY is included in the indexing of the Industrial Arts Index which is obtainable at Public Libraries.

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Published every other month. Per year to Members $2.50; to others $3.00. This issue $.75.

Entered as second-class matter, Dec. 17, 1921, at the Post Office at New York, N. Y. under the Act of March 3, 1879.

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Comment

NOTWITHSTANDING the very considerable literature on wage systems, we doubt whether there is general clear understanding of basic differences between the more important incentive methods of payment. The lecture which Colonel Hathaway delivered in Japan, printed in this issue, should help to a clear understanding of the differences, and particularly of the Gantt task and bonus system.

AMONG the classics of scientific management is the testimony before the Special Committee of the House of Representatives in 1911-12. This testimony has not been available to most of our readers because the report of the hearings was limited and exhausted soon after publication. The editor recalls that not more than two years after the hearings it took more than a year of inquiry before he was able to procure a copy. A few years ago we reprinted the Taylor testimony in the BULLETIN. We now have the pleasure of making that of Mr. Barth available. It is both informing and sparkling with the vivid personality of its author.

AMONG the discussions of unemployment after middle age, at a meeting of the Boston section of the Society, recorded in abstract in this issue, is one of the most important suggestions which has come to our attention. It is the suggestion of Elliott Smith, formerly with the Dennison Manufacturing Company, now Professor of Industrial Engineering at Yale University, that unemployment of older workers is not likely to be a characteristic of progressive firms continually improving their methods by small increments, but is likely to be a characteristic of industries which are conservative, which resist continuing mild pressure for improvement, and then in response to severe industrial conditions, like a dam bursting under severe pressure, make sudden and far-reaching changes. This suggestion checks with our empirical judgment and, we believe, offers an admirable subject for intensive research. If such a research sustains the generalization, then a way to avoidance of future similar unemployment becomes clear — a more general practice in industry of keeping facilities and methods of management up to date.

THE few current studies of unemployment of workers past middle age are concerned primarily with the questions whether there is such unemployment and what is the extent of it. Certainly these are basic questions which require answers before intensive and costly researches into causes are warranted. But there is no good reason why in the course of inquiry into the extent of unemployment the questionnaires should not be so framed as to pick up data which will throw light on causes. It will get us nowhere to inquire simply whether a firm has a formulated policy of squeezing out workers past forty-five or of refusing to hire replacements beyong that age. It is probable that most firms do not have such a deliberate policy. Yet their methods of management may automatically have the same effect.

THOSE accustomed to investigate such problems should know more than they now do about management technique, so that they may devise units of enumeration that will unobtrusively yield information concerning methods of management. They should know the ear-marks of different qualities of management, and how to grade the managements of the firms which they investigate. Then they should relate these facts concerning management to the facts concerning unemployment. We venture the prophecy that there would be found much less unemployment of older workers as the scale is ascended. For where scientific management exists with its *continuing* study and improvement of methods, the older workers adjust to and improve with the technique, and, with their cumulative experience, become too valuable an asset to let go.

Taylor Society Serves I. C. C.

Government Commission Invites Society to Give Information on Cost Accounting

IN 1927, the National Industrial Traffic League, an organization of shippers, requested the privilege of submitting for the consideration of the Interstate Commerce Commission an accounting system for the steam railroads which would afford adequate information for obtaining comparable service costs. The present accounting system of the railroads does not include a cost system in any way comparable with that commonly used in industrial enterprises. Cost of service is of course a dominant factor in most of the cases before the Interstate Commerce Commission.

The public hearing requested by the League was held before Commissioner Joseph B. Eastman in March, 1928, and the record is identified as *Ex Parte* 91. Many interests were represented; railroads and other utilities; state public service commissions; associations of shippers; accountants and various other groups. Many witnesses were heard. The I. C. C. has recently issued Commissioner Eastman's "Proposed Report"—a preliminary report which invites additional briefs before the final report is made.

This preliminary report will interest members of the Taylor Society in that it discloses an important public service rendered by it. "At the request of the presiding commissioner, it (Taylor Society) presented at the hearing comprehensive and very informative evidence in regard to the application and use of cost finding or accounting in private industrial enterprises, and to some extent also in the public utility field. Both the theoretical and practical sides of the question were developed by this evidence. Upon the practical side, testimony was offered by both executives and comptrollers of several industrial concerns engaged in diverse forms of business. . . .

"The witnesses presented by the Taylor Society disclaimed generally, it should be said, any experience in the railroad business, and their testimony was directed to accounting practices in other industries, in the hope that such information would be helpful to the commission in solving the problem involved in this proceeding."

The burden of planning and organizing the presentation of testimony and of conducting the examination of witnesses was borne by two leading members of the Philadelphia bar—Thomas Raeburn White and Harold Evans. Of the generous, public-spirited and effective participation of these attorneys the Taylor Society makes acknowledgment; without their skill in such matters the contribution of the Society would have had a value far below that which the commissioner's report indicates it did have.

Likewise acknowledgment must be made of the public spirit of members and friends of the Society who served as witnesses: Joseph Carlin (ready-made clothing); Henry S. Dennison and Robert N.

Wallas (miscellaneous paper and stationery products); Frank E. Northime (cotton textiles); E. B. Passano and G. H. Rowe (printing and publishing); H. S. Person (general); Hudson W. Reed (electric utilities); Morton C. Tuttle and C. E. Patch (industrial construction); John H. Williams (general); Robert B. Wolf (prepared paper); Henry N. Woolman and G. N. Shelmire (milk distributors). To make preparation by review of experience in order to insure accuracy of statement and by the collection of exhibits; to absent one's self from one's business for several days; to give the direct testimony and then face the cross-examination of railroad attorneys—these things involve labor and sacrifice, but the results were worth the sacrifices.

The summary and analysis of the Taylor Society block of evidence occupies a conspicuous place in the proposed decision. When one compares this analysis with the conclusions of the commissioner, one cannot resist the inference that there is a relation between the two.

The decision is a most important public document, acute in analysis, felicitous in expression, judicious in its conclusions. We quote from the conclusions only in part:

"If need exists (for changes in railroad accounting), it may be of two kinds: (1) a need related to the efficient and economical management and operation of the properties, or (2) a need related to the public regulation of their charges and service.

"Whether a need of the first kind exists it is impossible to determine with any assurance from the present record. In the past few years the railroads have made, on the face of things at least, a most excellent showing in the reduction of operating costs. . . . we are not directly responsible for the management and operation of the railroads, and it may at least be doubted whether we would be justified in imposing a new accounting system upon them merely for the purpose of achieving results in efficiency and economy which their executives believe can be better attained in other ways . . .

". . . . To justify such action (the imposition of a new system of accounting), a clear need of the second kind above described ought to exist, e. g., a need directly and immediately related to public regulation.

"This raises a highly important and interesting question. It has always been recognized that cost of service, although not controlling, is a very important factor in the determination of just and reasonable rates. This has been recognized by both shippers and carriers and by the courts. Despite the protestations of the carriers, in a proceeding like this, that cost of service is of little or no importance in the making of rates, hardly a rate case is tried before the commission in which they do not, in one way or another, rely in part upon cost of service. . . .

"Cases not infrequently arise, moreover, where charges are based squarely on cost of service. . . .

"Aside from cases like these, where rates have been based squarely upon service costs, such costs have for some time been assuming a steadily growing importance in our work generally. . . .

"This tendency to stress the importance of cost of service has been strengthened by the legislation of recent years. . . .

"Without multiplying many other like illustrations, beyond question the fact is that service costs are entering more and more into our deliberations, and that there is every indication that this tendency will continue to grow. . . .

"Hitherto the information upon this subject has in general been of an unsatisfactory character. . . . The question here is whether we are now warranted in going further and requiring the adoption of some uniform system of continuous routine cost accounting. . . .

"It is recommended, therefore, that the commission find that it is not justified on this record in prescribing a system of continuous routine cost accounting, with accompanying statistical requirements; but that it has been shown that there is clear warrant and need for further intensive research into this subject and that it should be carried on under the auspices of the commission. As an appropriate means of research, it is recommended that a special committee be selected by the commission composed of representatives of the railroads, the state commissions, the National Industrial Traffic League, the Taylor Society and our own staff. . . . to conduct a thorough inquiry into the general subject of the best means of obtaining adequate information in regard to service costs, giving particular consideration to the practicability of a system of continuous routine cost accounting, and to report their conclusions, together with the reasons therefor, to the commission at as early a date as is consistent with adequate research."

Incentive Wage Systems[1]

With Particular Reference to the Gantt Task and Bonus Plan

By H. K. HATHAWAY
Consulting Engineer, New York

IN DISCUSSING this subject my object is not, as has been the case of most of those who have dealt with it, to describe in a technical or academic way the numerous incentive pay systems that are known by the names of those who have devised them, but rather to present to you in what I hope may be a convincing manner:

1. The fundamental principles that underlie the classes into which the various pay systems may be logically grouped;
2. The objects that each class is intended to accomplish;
3. The vast difference that exists between the class advocated by Taylor and his associates and all others.

Basic Classes of Wage Systems

When I first became interested in industrial management there were only four generally known systems of wage payment: (1) day work, (2) ordinary piece work, (3) Taylor's differential piece work, (4) Halsey's premium plan. General or group profit sharing and the contract system may have also been found in isolated instances. Straight day work we may disregard, as it may not properly be considered in any direct sense as being an incentive to anything except inefficiency.

The other three fall into two main groups, as will also virtually all other incentive pay systems. These Taylor designated as: (a) Drifting Systems, (b) Task Systems.

The drifting systems group would include straight piece work as well as the Halsey premium plan and all of the many modifications thereof, such as those bearing the names of Rowan, Emerson and others. For a time it seemed as if every individual who blossomed forth as a so-called efficiency engineer was fired by an ambition to have a pay system known by his name. One case has recently come to my attention in which an individual went so far as to utilize his name as a designation of time elements or units of work performed.

Taylor's use of the term "drifting system" in connection with Halsey's premium plan was objected to by Halsey, while Henry R. Towne, whose profit-sharing plan Taylor included with Halsey's, not only raised no objection but concurred with Taylor.

Essential Differences Between the Two Main Classes

The chief characteristic of the drifting systems is that while they aim to offer an incentive to the worker to produce more than he would under day work and to reward him for such increased production, the management evades, or at least does not consciously and fully assume, responsibility for determining *how much work should be produced, the manner in which it should be produced or what facilities may be essential to obtaining the higher production.* Neither does it fully assume responsibility for selecting and training the worker or for rendering him service beyond the practice prevailing under the ordinary old style management. In short the burden of responsibility and of initiative for the increase of production is placed squarely on the shoulders of the workman.

In this we may see, as in many of the ideas that have dominated the workers and their unions, a mental or psychological reversion to the prefactory days of craftsmanship, when the master workman provided his own facilities and produced a complete article with little or no assistance.

These drifting systems may under certain circumstances be justified as expedients or as intermediate stages in the progress of an industry toward something better. In many cases they may, however, prove to be an obstacle to progress and lead to serious trouble or disaster, as I shall endeavor later more fully to show.

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[1] An address before the Osaka Bureau, March 9, 1929, and the National Management Association, Tokyo, March 29, 1929.

Efforts to utilize these systems in connection with scientific management may be attended with better results than without, but in greater or lesser degree their effectiveness sooner or later will diminish.

On the other hand the task systems, of which up to the present time there are to my knowledge only two — Taylor's differential piece-work and Gantt's task-and-bonus plan — to be successfully applied necessitate that the management assume its proper share of responsibility for the attainment of results. They are designed to meet the needs of scientific management.

Indeed, they cannot and should not be used except under the rather highly standardized conditions and precision of planning and control found only under a well developed application of scientific management. The other forms of wage payment are better adapted to what have been characterized as the "unsystematized" and "systematized" stages through which it seems necessary for management to progress before attaining the so-called scientific form.

Task Systems Require Scientific Management

The task systems of payment involve the obligation for carrying out in practice what Taylor referred to as the four principles of scientific management. Briefly stated, these are:

1. The development of a science or art in the place of rule of thumb in each industry.
2. The scientific selection and training of the workers.
3. A proper division of responsibility between the management on the one hand, and the scientifically selected workmen on the other.
4. The bringing about of what Taylor termed "hearty co-operation between the management and men."

In order to apply a task system the management must know at least as much about the doing of the work as do the workmen, and it ought to know more—certainly more than any *one* workman. This knowledge it acquires by analytical studies of the equipment, materials, processes and all conditions affecting the work. As a result of such studies it brings together and codifies not only the combined best traditional knowledge, but eliminates that which is unsound and adds through research and experiment much of value to that which previously existed. The development of high-speed steel was one outcome of such investigation. Improvement of equipment, of methods and the establishment of standards are another result of these studies. This is briefly what is involved in the application of the first principle of scientific management. Without this it is obvious that the management is in no position to say definitely, as a task, how long it should take to do a given piece of work. Without the application of this principle neither the management nor the worker can have any honest confidence in the rates set.

Injustices, Inequalities and Shortcomings of Drifting Systems

Under all systems other than task systems there will almost invariably be found among a given number of workers engaged in doing the same kind of work a wide variation in earnings; taking the earnings or the production of the best as 100 per cent the range will extend downward frequently to 40 per cent.

Where there is some variety in the work done, such as would be the case, for example, in folding handkerchiefs, to which I referred in my paper on standards—where there would exist variation in size, in kind of material or the kind of fold—this variation in earnings might be accounted for in part by what the workers term "good work" and "bad work." "Good work" means that for which the piece rate or premium rate has been set relatively too high, and "bad work" that for which the rate is unreasonably low. The injustice and evils of inequalities of rates when set by unscientific methods I shall take up again later. However, unequal rates are only in part responsible for such great variation in earnings as I have cited, as such variations will be found even where the work of each operator is identical.

The main cause, apart from unstandardized conditions and delays for which the operator is in no sense responsible, lies in the failure of the management properly to apply the second principle set forth by Taylor—*first* to select the workers, if not in a manner scientific in the fullest sense of the word, at least intelligently with regard to the fitness of the individual for the work to be done; and *second*, which is of even greater importance, to train the worker by giving such instruction, assistance and encouragement as may be needed to bring the production of the less experienced or less naturally skillful up to the highest level.

When such variation in earnings is brought to the attention of the old style manager it merely results in self-pity and the lament that some of his employes are good workers and some are not. He regards this condition as an act of God—something beyond his province and power. And, indeed, it is difficult to correct except through the development of an organization, mechanism and standardization such as scientific management requires for the application of its principles.

Scientific management goes a long way toward elimination of differences in ability of various individual workers within a given range; and a large percentage of those who under the old system would be regarded as only fair or even poor become first-class workers through the removal of difficulties with which they are unable to cope and the assistance and co-operation of functional foremen. This implies the application of the third and fourth of the principles stated.

Let us now subject the two principal types of what Taylor termed the drifting systems to a critical analysis.

The Weaknesses of Ordinary Piece Work

Straight piece work has a number of disadvantages:

1. It is objectionable on account of its inflexibility. For instance, assume we have a group of operators doing a certain kind of work, all of whom are paid the same rate. Some of them may be operators who have been with the concern for a great many years and are efficient operators, but some of them are new. Some are efficient, reliable and loyal; some are not. Yet all are earning the same rate. You cannot very well under piece work pay one operator one piece rate and another operator another piece rate for the same job. Furthermore it does not readily permit natural and gradual readjustment of wage rates to meet economic changes.

2. Among say forty or fifty operators it will usually be found that possibly four or five of them are at the top earning the top wage. Taking that as 100 per cent, the least efficient get 35 or 40 per cent of the best operators' earnings, and the average is probably around 60 to 70 per cent. In other words, the best operators' production represents what should be obtained, but the average is around 60 or 70 per cent. The reason for this is that under straight piece rate the management does not regard itself as being responsible for how much or how little any operator turns out. Neither does it assume responsibility for scientifically or even carefully selecting and training the workers, or for the conditions governing the work.

3. A given worker at one time may turn out a high rate of production and at another time he may fall off 10 per cent or more. It does not worry the worker or the management, because the latter *pays the worker only for what he does.* It follows that this encourages absenteeism, tardiness and letting down on production for any and all reasons. The fallacy that "we pay only for what they do" blinds the management to all sorts of inefficiency on the part of everybody from the worker to the general manager. Especially is this true in the matter of keeping workers supplied with an ample supply of work—utilization of plant capacity. If the management overlooks the fact that overhead costs are an important factor one cannot expect the worker to feel that there is any injustice to the employer in letting down on production.

4. The fact that under straight piece work it is very difficult to transfer operators from one class of work to another, in addition to the foregoing objectionable features, results in the force at many times being larger than it should; and while there is no loss from inefficiency in the matter of direct labor cost there is a constant loss in indirect cost. This tends to excessive specialization and lack of advancement that is detrimental to the best interest of both employer and employe.

Very soon one finds under a task system that it pays to teach the workers to do a variety of things and to plan work well in advance, so that at all times there will be a balance maintained between the force of workers and the amount of work available for them.

To make this clear I shall cite the following typical case from my own experience. In a large book-binding establishment the plant was divided into a multiplicity of so called departments in each of which was performed only a single simple operation; such, for example, as pasting illustrations into books; laying gold leaf on covers previous to stamping; and pasting head bands in covers. The operators in one of these departments did not know how to perform any work other than the simple operation done therein. As the type of books varied considerably from time to time—there being for instance at certain periods an excessive number of books in which illustrations had to be pasted, but requiring no gold leaf laying, and at other periods the reverse of this condition—it frequently happened that there was a shortage of operators in one department while in an adjoining one there was an excess.

In the department where temporarily there were more operators than required, such work as there was to be done was divided up among them—with the result that they all earned less money—until either the conditions improved or, if the shortage of work continued long enough and became more pronounced, some operators were laid off and others quit. In the meantime additional workers were hired to take care of the temporary excess of work in the other department. What I have here described may be identified as "unemployment within employment."

Under scientific management in this plant workers were progressively trained to perform a number of operations, and were advanced with corresponding increase in pay as their abilities developed from a lower to a higher class.

As Taylor pointed out in "The Principles of Scientific Management," it is under straight piece work with rates set on a basis of "judgment," "experience," "timing pace-makers," or just plain guess, that the art of soldiering is developed to its highest degree. In self protection on the one hand against rates being set so low as to make it impossible to earn a fair day's pay, and on the other hand against the danger of rates that permit of unusual earnings being arbitrarily cut, the workers are induced to resort to every manner of deception and subterfuge.

The management suspects the workers of "holding out"—that is to say, of not doing an honest day's work—and the workers, by reason of obvious and glaring inequalities in the rates for different jobs, feel that the management does not know its business and consequently lack faith in its integrity.

In the absence of any scientific method of determining how much work should be accomplished in a given time or how long it should take to do a given job, there frequently, even under day work and almost always under piece work, develops a spirit of mutual distrust. Disagreement and argument constantly arise and lead in many cases to serious labor trouble.

The Halsey Premium Plan in Theory

Under Halsey's plan as originally conceived the "premium time," or rate for a given job, is the time in which it had been performed previously to the establishment of the premium plan. The assumption is that in some way, by working harder, by exercising *his ingenuity* to effect improvement in method, equipment or other things and in elimination of causes of delay, *the* workman for the sake of the premium offered will accomplish the job in less time than had been required to do it in the past.

Any saving in time or direct labor cost thus effected is shared between the worker and the employer, usually one-half going to each.

For example, if in the past a job has taken ten hours to do, and the worker under the new scheme succeeds in doing it in, let us say, six hours, he will receive, in addition to his regular pay for the six hours taken to do the job, pay for one half the four hours "saved," or two hours, making in all eight hours' pay for six hours' work.

Under straight piece work the entire saving in direct labor cost would go to the workman instead of the management receiving half.

Halsey's plan possesses one real advantage over ordinary piece work; it assures the worker of his hourly rate of pay and permits a varying of the hourly rate for a given kind of work to compensate for length of service or greater worthiness. It also facilitates in case of emergency the temporary transfer of workers from a higher to a lower paid class of work without their suffering a loss of earnings, as well as the natural and gradual adjustment of compensation to meet the economic changes that are constantly taking place. Furthermore, it does not in itself encourage excessive and uneconomical specialization as does straight piece work.

Halsey's Plan in Practice

To those persons whose knowledge and experience do not enable them to see beyond the surface, this plan would seem to possess great merit and to be eminently fair both to employer and employe.

Let us see, however, how it works out in practice; and in this discussion I shall draw only upon my own actual experience or cases that have come under my actual observation.

I have referred to setting the premium time on a basis of the time that work has previously taken. I had an illuminating experience with that method about twenty years ago when Halsey's system was receiving much attention, it having just been endorsed and recommended by the National Metal Trades Association. A concern of which I had just become superintendent had been tabulating over a period of two years the time taken for each operation on each item of their product. I found such wide variations as from less than one hour to twenty hours for planing a connecting rod for a steam engine! All I could do was to use my best judgment in deciding what to adopt as the premium time, eliminating those records that seemed unreasonable. I also found later on that certain operations had been performed by competent and conscientious workers—for whom there was little opportunity to reduce their past times—while others had been done by men who were lazy and incompetent, whose past output could easily be doubled.

It is obvious that rates thus established must in a great measure be unfair and not result in improving the management's standing in the minds of the workers.

Even if there did not exist the objections I have cited to rates based upon past performance, a greater difficulty presents itself. I refer to the manufacture of new products, to changes in old products, and to radical improvements in equipment or methods. There being no records that may be used in setting the premium time for these, it must be arrived at by some sort of estimate—usually in the same way that old-fashioned piece rates were set. They may be high or they may be low—as a rule they will be consistently low in comparison to older rates based on records of past performance. Lack of uniformity in rates under any scheme is objectionable. In piece-work shops this is what I have referred to as "good work" and "bad work," a great obstacle to efficient management and a source of trouble, as anyone who has had experience with it, including many a foreman or superintendent, can tell you.

Halsey's premium system has been used in shops where in varying degree the premium time has been based upon studies and standardized conditions. It has even been used in connection with an otherwise really good application of the principles of scientific management, but its use under such conditions has never appealed to me for the following reasons:

1. It seems foolish, when under standardized conditions the studies unquestionably show that a job can and should be done say in ten hours, to tell the worker that twenty hours is allowed and that he will be given half of what he saves if he does it in less.
2. Theoretically at least the management has no cause to complain if the workman takes anywhere up to twenty hours to do a ten-hour job; it is up to him.
3. There is not a sufficiently clear placing of responsibility on the management for the maintenance of standards upon which depends the performance of the work in the time the studies show it should be done. If the worker exceeds this time it is too easy to blame the workman and, as in straight piece work, the old excuse may be fallen back upon that some are good workmen and some are poor.

Effect of Changes in Method and Equipment

To illustrate more concretely the fundamental weaknesses of such pay systems, let us say that a concern which has adopted the Halsey premium system has a cylinder to be bored, planed and drilled. There will be a certain time set for each of these operations based upon records of the time it has taken to do them. At the time the premium rates were established, the practice was to set that cylinder on a pair of V blocks on the carriage of a lathe, and bore it out. They faced it by clamping a facing head on the boring bar. They planed it by setting it on a planer and laying it out and drilling it, one hole at a time.

Now let us suppose that all of a sudden there develops an increased demand for that particular cylinder; so great a demand that they put in a special boring mill which enables them to do the boring in very much less time than required by the crude method used before. Next, they put in a multiple spindle drill which enables them to drill from a jig all of the holes at one time.

When they established the time for doing each of these operations, they promised the workmen that they would not cut the rates. Half of any saving thus effected was to be given to them. But under the new conditions, the work takes, let us say, less than one-quarter the time it took when the rates were established. The same condition in greater or lesser degree develops in connection with all the products of the plant. Little by little there creep in various improvements for which the workers are in no way responsible.

This illustration points out a very significant and common fault found in most applications of either piece-work or premium systems. The rates set were simply for boring, planing and drilling each cylinder whether there might be one or one hundred to be done at a time; the particular machines in which the operations were to be done were not definitely specified; nor was the method by which each operation was to be accomplished or the tools to be used specified.

I think it will be obvious to you that rates which may be correct and fair to both employer and employe for work done under one set of conditions will not be so under radically different conditions.

Now let us suppose that the company we have been discussing has competitors, one of whom has recently entered the field. This newcomer has modern equipment and is not handicapped by premium rates established by antiquated practice which the employer has unqualifiedly promised not to change.

His men may even on day work be turning out much more product than the workers in the older establishment who feel that it would be unwise and unsafe for them to show too great a contrast between the premium time allowed and the time taken to do their work.

Employers are prone to assume that the workers will grasp every opportunity to decrease the time taken to do work and so earn higher premiums. Experience, however, does not justify such an assumption, and as a rule it will be found that in every shop working under straight piece work or premium systems as ordinarily applied, the workers have set for themselves what they regard as a maximum that they may safely earn.

Let us return to our illustration. The newer competitor in the case cited enjoys not only a lower direct labor cost but a correspondingly lower overhead or indirect cost, and as a consequence can undersell the older company, which must either lose money or lose orders.

This condition obliges the older company, if it is to remain in business, to cut the premium rates, and in so doing to go back on its agreement with its employes. And that is exactly what happened in the case of a well known American company, with the result that it caused a disastrous strike.

I shall not take time to discuss the modifications of the Halsey plan, as to do so would only distract attention from the vital and fundamental points that I am trying to bring out. Many of these modifications have in their attempt at improvement only resulted in complicating matters and adding to the basic defects of the original scheme.

The Task Idea

Taylor was the first to formulate and advocate a system of pay embodying what for want of a better name he designated as "the task idea"; that is to say, a system under which increased earnings depend upon the performance of a definite job, or task, within a definite accurately determined time, under definite standardized conditions, in a definite, prescribed manner, and in accordance with definite requirements as to quality.

This plan Taylor described in a paper—"A Piece-Rate System"—presented before the American Society of Mechanical Engineers in 1893, in which he not only presented the task idea, but what was of at least equal and perhaps even greater importance, explained and advocated elementary time-study as a means of accurately or scientifically setting rates. In discussing the task system it should be understood that the time computed for any given job is based upon elementary time study.

Taylor's Differential Piece Work

Briefly the Taylor "Differential Piece-Rate System" provided for the payment of a high piece rate for the accomplishment of the task and a low piece rate in case of failure. While there is no necessarily fixed relation between the high rate and the low rate, which might properly vary considerably for different kinds of work, let us for illustration assume that the former is one-third greater than the latter. For example, if a worker to accomplish his task should produce one hundred units of work in ten hours, the high rate would be six cents per piece, whereas if he took longer than ten hours to accomplish the task, whether he might exceed the time by five hours or five minutes, he would receive only the low rate of four and a half cents per piece.

The *important point* to be here considered is that:

1. The management assumes responsibility for the conditions under which work is done, for prescribing the method to be followed, and for scientifically determining the time in which the work should be done.
2. The worker receives a higher rate of pay for the accomplishment of his task and a more severe penalty or loss of earnings for a lower rate of production than under ordinary piece work.

While this plan of payment, adopted as an element of a properly developed, properly installed and properly administered system of scientific management, gets away from a majority of the objectionable features—both from the viewpoint of the worker and from that of the employer—of straight piece work as ordinarily applied, it still has the disadvantage that the same rate would apply to all workers doing a given kind of work irrespective of length of service, versatility, regularity of attendance and other considerations which may make some workers more valuable to a company than others, even though their rate of production may be the same. It does not lend itself readily to adjustment upward or downward to meet gradual economic change. And finally, while not intended to do so, it encourages, or at least does not sufficiently discourage, the worker from trying to do more than the task called for. That is, in the vernacular of the shop, what is known as "beating the rate" or "speeding."

And here lies one of the vital differences that distinguish scientific management and the task idea from all other systems of management or incentive pay systems that preceded it, or have been offered as substitutes since it became known. *Scientific management does not expect the worker to do any more than is called for by the scientifically set task,* and the reward in the form of extra compensation is paid for *attaining* that proper and reasonable standard.

The logic and justice of this viewpoint is, I believe, self evident and beyond question. On the other hand all other incentive pay schemes, and the systems of which they form a part, expect the worker to turn out more work than is specified by the time or rate which the management establishes. This is fundamentally an admission on the part of the management of ignorance, of evasion of responsibility, and of lack of confidence in itself.

Experience has taught us that under scientific management the standard of production may not be exceeded to any appreciable degree without detriment to quality of product or injury to equipment or to the well-being of the worker, all of which are contrary to the best interests of both employer and employe. I might cite many actual examples to support this contention. This is a matter well worthy of serious reflection.

Gantt's Task and Bonus Plan

In my own practice I have never utilized differential piece work, but have used in almost every case the Gantt task and bonus plan, which to my mind is in all respects the most satisfactory scheme for any plant operated under a system of scientific management.

This scheme was developed while Gantt was working with Taylor at the Bethlehem Steel Works, and at that time and for a number of years afterward they felt that its greatest advantage lay in the less severe penalty for failure; that it was preferable therefore to the differential rate, especially during the earlier stages of the development of a system of scientific management, before conditions are fully standardized and the planning and control system still imperfect.

To some extent it was regarded as an intermediate step toward differential piece work. In my own experience I have not found the less severe penalty feature to be of any importance in actual practice. It might at first appeal to the worker and the manager — giving the former a greater feeling of security—but the fact is that if the work which properly must precede *any form* of task system has been well done, and if the task system is properly installed, the workers should and will accomplish their tasks in the time set *right from the start.* So far as that is concerned, either system of pay might be established. In actual practice, if the system is properly installed and administered, it is an exception for a worker to fail to accomplish a task on time, excepting when the cause of failure is obviously beyond his control. Every such case is investigated and, if the circumstances warrant, extra time is allowed for the specific job only, as for instance in the machine shop practice if a casting has excess stock requiring an extra cut, or material is harder than it should be, necessitating less feed or speed than that specified. Where such extra allowances are made, steps are taken to prevent the trouble recurring in the future. They should, of course, be of infrequent occurrence. Usually they are reported, investigated and adjusted while the job is in progress. It has been my experience that in the great majority of cases, failure to accomplish a task is due to some shortcoming of the management rather than of the worker.

The Gantt task and bonus plan, except that it is based upon a rate per hour—in other words a definite time for the accomplishment of a given amount of work—and that the penalty for failure to attain the standard of production is less severe, is basically the same as Taylor's differential piece work. Both embody the same fundamental principle—the task idea out of which scientific management grew. Under this plan the workers are paid an hourly or day rate regardless of whether or not they may accomplish their tasks and earn their bonus. These hourly rates should be and almost invariably are higher than those generally paid in the community for the same class of work—usually from 5 to 10 per cent higher. This has the desirable effect of attracting and holding the better class of workers.

Amount of Bonus

In addition to their hourly pay the workers receive an additional compensation, or bonus, for attaining the standard of production and quality.

The rate of bonus in different establishments or for different classes of work in the same establishment may vary, depending upon the nature of the work, from a minimum of 20 per cent to as high as 100 per cent of the task time. For work such as a general machine shop involves, 35 per cent has proved reasonable. Classes of work making greater demands on skill, exertion or responsibility, or of a disagreeable nature, call for a higher rate of bonus. On relatively simple repetitive work 25 per cent is satisfactory, although if the gains in production permit, as they usually do, it is better to pay 30 or 35 per cent. Anything less than 20 per cent is not sufficiently attractive to be effective. How high the bonus rate may be placed depends in some measure upon the savings in direct wage cost resulting from the change to task and bonus.

For illustration of the working of this scheme, let us suppose that 10 hours is the task time for a job; 35 per cent, or 3½ hours, the bonus to be paid if the job is done in 10 hours or less, and the worker's day rate to be $.50 per hour. If the worker finishes the job in 10 hours he receives 13½ hours' pay @ 50c = $6.75, or $.675 per hour. If he does it in less than 10 hours he is paid for the time taken plus the bonus time, 3½ hours. If, for instance, he takes only 8 hours, his pay would be 11½ (8 + 3½) x $.50 = $5.75 or $.72 per hour. His bonus rate based upon the time taken would in this case actually be 43.7 instead of 35 per cent. His total pay for the job would have increased only 6⅔ per cent while he saved 20 per cent of the time allowed.

A little study of these figures will show that thus applied the incentive for the worker to beat the time is not very great.

If on the other hand the operator were to exceed the time, regardless of by how much or how little, he would receive only his day-rate pay for the time actually spent on the job. He would also forfeit any bonus if his work should fail to be in accordance with the required standard of quality. For illustration, let us suppose that instead of accomplishing his task in ten hours the worker had spent eleven hours on the job; he would then be paid for eleven hours only at his hourly rate of fifty cents, or $5.50, instead of $7.42, which would have been the case if he had earned his bonus on work done during the whole eleven hours.

Danger of Doing Work in Less Than Task Time

Gantt later changed this—unwisely, I believe—so that if in any case the job were done in the task time or less, the worker would be paid for the time allowed plus the bonus time, making the plan identical with Taylor's differential rate in that respect. Thus if the job were done in 8 hours the worker would be paid 13½ x $.50, or $6.75, instead of $5.75 as in the original scheme. This places a premium on *beating* the time set rather than *meeting* it, and in that, it has been my experience, a grave danger lies. It is a siren song to which the inexperienced or the greedy manager is all too willing to listen. Of course, in taking as an illustration the accomplishment of a ten-hour job in eight hours, I have gone to an extreme. Providing that the time is accurately set, that there is no error in writing the instruction card defining the method, that the method is followed in doing the work, and that all of the conditions as to quality are complied with, there should be no such possibility, and it is unreasonable to expect other than the exceptional worker to do a job in less than the time set.

I feel justified in again pointing out that any such expectation indicates a lack of faith in the management's own ability to do its work properly, and will ultimately lead to disaster. Under task and bonus or differential piece work as applied in connection with scientific management, it is just as dangerous and undesirable to have work done in much less than the task time as to have it take more than the task time.

Where workers consistently beat the time it will invariably be found that it is at the sacrifice of one or all of the following: quality of work, tools and equipment, the worker's own welfare. Here lies the objection to Gantt's modification of his scheme, and I assure you that it is a very real one, although most people have to burn their fingers before realizing it.

In one shop there was a perfect mania for beating time. The quality of the work turned out went down steadily, machinery and tools were put out of commission, and the management lost more than it gained. Under the task and bonus system when properly applied, it will be found that, taking a plant as a whole, 95 per cent of all the work is done in the time set.

Influence Upon the Management

The effect of this system upon the management is to my mind of greater importance than is the incentive that it gives the worker. It is what vitalizes the organization and the system.

Under the task and bonus system a sufficient number of hours' work *must* be kept ahead of the worker. The loss of bonus in case each job is not finished on time being large enough to overcome any inclination to stretch a job out when work may appear to be scarce, or to overcome the tendency to soldier—which, as I have stated, arises at times under straight piece work—the worker may be depended upon to turn out his jobs on time and *to complain if he is not kept supplied with work or if standard conditions are not maintained.* As it is customary to pay the functional foremen in the shops a bonus based upon the percentage of jobs finished on time by their men, they may be counted upon to back up their men in holding the management up to the responsibilities of its job. In this lies perhaps the greatest merit of the task systems —the workers push the management more than the management pushes them.

Failure to provide enough work results in a just penalty upon the management under Gantt's scheme, as the workers must be paid at their day rate for any waiting time, which is charged to that branch of the management responsible and cannot be ignored or hidden by tacit understanding, as is the case under piece work and in varying degree under a premium system.

Task and bonus in connection with suitable mechanisms—route sheets, operation orders, bulletin boards, etc.—for planning and control of plant operations, leads to the maintenance of a force properly adjusted to the volume of work, instead of one large enough to handle the peak load in all departments or operations. It results in looking further ahead, in more uniform earnings for the employes, and in the long run in smaller labor turnover. Employes are taught to do more than a single operation so that if one class of work drops off and another builds up, they can be shifted to meet such fluctuations. Contrary to the opinion held by the uninformed, there is less of objectionable, intensive specialization under scientific management than under systematized or unsystematized management Versatility on the part of a worker is an asset, and it is an advantage to be able to pay a higher rate in proportion as a worker is able to do any work to which he may be assigned. This is possible under Gantt's scheme.

Importance of Clearly Defining Methods and Conditions

In conclusion I want to emphasize the importance of something which is too little understood and to the neglect of which may be traced many of the failures or troubles resulting from any incentive scheme of wage payment; that is, failure to back up the task time with a clear and detailed definition of the method, the machine, the tools and the conditions upon which the set time is based. To say that the time allowed for boring a cylinder is ten hours without specifying these things is comparable to saying that it should take a man one hour to travel four miles without specifying whether he is to go by ox cart or automobile, whether carrying a heavy load or nothing. It is like telling a contractor to build a house for $20,000 without saying what kind of house is wanted.

For every job there should be a detailed instruction card giving the time for each elementary subdivision of the job and a complete list of the tools required. Examples of these may be found in my paper "Standards"[2] with which I believe you are familiar. These must be made accessible to the worker for each job he does—not filed away in the office or planning department — and the management must see that the method upon which the time is based is followed.

Just as the standard method and equipment involved in the performance of an operation must be clearly specified, so also must the *quality* of workmanship be definitely and clearly indicated on drawings, specifications or their equivalent. Inspection for quality, vitally important under any incentive system, is under a task system imperative. It must be borne in mind that the bonus is paid not only for performance of the work in the time set and according to the prescribed method, but also for its being up to the standard of quality specified, which of course, largely governs the method and time.

If it is clearly understood that the time allowed for a job is for doing it in accordance with the specifications, and the method is covered by detailed instruction cards and tool lists, the time *may be revised* without any objection or resentment from the worker, to take care of improvement in methods, equipment or material, changes in design, and so on, a new instruction card taking the place of the old one in all such cases. What ordinarily happens in the absence of detailed instruction cards showing what the time for the job or the rate includes, is that changes of this sort and improvements are made in the work without changing the rate or time allowed. Usually such changes taken individually are quite unimportant and affect the total time very little, but they come about insidiously and steadily, and in the aggregate over a period of several years amount to a great deal. They are perhaps the greatest cause for rate cutting and other apparent breaches of faith; and while they may be justified and inevitable from a business and economic standpoint, the worker cannot be blamed for feeling that they are unfair.

In the lack of standard conditions, clearly defined methods and quality, and of accurate knowledge as to the time work should take, will be found, I believe, the root of organized labor's opposition to any pay system other than straight day work. Gantt's task and bonus system in its original form, when based upon a properly laid foundation and properly administered as a part of a complete system of scientific management, is in my judgment not only the best system from the standpoint of accomplishment in the matter of high production and low cost, but is tremendously valuable as a preventive of those misunderstandings and that mistrust that are at the bottom of most labor troubles.

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[2] Cf. *Bulletin of the Taylor Society*, Vol. V, No. 1, February, 1920; reprinted, Vol. XII, Nos. 5 and 6, October and December, 1927.

Annual Meeting

Hotel Pennsylvania, New York

December 4-6, 1929

Following the program announced in detail in the August issue, this meeting will include the papers and discussions on problems of policy and procedure raised by the report of the Hoover Committee on Recent Economic Changes—general administration, marketing, employer-employe relations, development technique, etc. Among the speakers already secured are: R. W. Burgess, Western Electric Company; Howard Coonley, Walworth Company; H. K. Hathaway, Consulting Engineer; J. E. Judson, Ford, Bacon and Davis; John Lawrence, New England Council; Wesley C. Mitchell, Economist; Paul Nystrom, Marketing Counsel; N. M. Perris, Stevenson, Harrison and Jordan; M. C. Rorty, International Telephone and Telegraph Company.

Save These Dates

Carl G. Barth on Scientific Management[1]

Testimony Before the Special Committee of the House of Representatives January 31 and February 1, 1912.

IN THE June-August, 1926, issue of the BULLETIN *the Taylor Society reprinted in full the testimony of Frederick W. Taylor before the special Committee of the House of Representatives in 1912. This made available to our readers a rare and important document of scientific management. Some of our readers who had been concerned with the hearings of the committee suggested that the testimony of Carl G. Barth ranks with that of Taylor in importance, and expressed the hope that some day we could publish it. We are pleased to be able to satisfy this desire.*

Asked if he desired to make any comment on the testimony in the light of subsequent experience, Mr. Barth wrote us recently:

"I have reread my testimony of 1912 and find that I have but little to say about it, and I shall leave it to you to extract the few lines that may appeal to you as worth while publishing in connection with the republishing of the testimony in the BULLETIN.

"I realize that I evidently felt highly indignant over the whole investigation, which I considered an unwarranted interference with and reflection on the excellent and beneficial work I am still 'perfectly willing to admit' that I was engaged in at that time, and into which I enthusiastically threw all the energy that was in me.

"I realize that, in my efforts to convince the members of the committee that I was qualified by training and experience to express opinions deserving of their respect and consideration, I must have felt very much on the defensive, and that I was thereby led to make many of my statements in a manner that savored of conceit.

"But I see nothing in my testimony that looks different to me today from what it did then, while if the investigation had taken place two or three years later I could have cited far more glaring examples of systematic loafing by workmen than I did in my testimony, all however, chargeable to poor management rather than to a desire to loaf for its own sake.

"I realize that, at least the chairman of the committee was not able to fully believe that, whatever difficulties I had encountered on the part of workmen, they had been so insignificant compared with difficulties with foremen and high-ups, that they had left no impression on me as a thing to be reckoned with. All my later experiences did not alter this impression, though I must admit that it might have been different had I ever been engaged to reorganize a union shop. All my work has happened to be in open shops, though often with a fair percentage of union men among the workers.

"While my own testimony took only a few hours, I spent a whole week listening to the testimony of other witnesses, many of them union leaders, and it certainly was an unpleasant revelation to learn the bitterness which most of the latter in their ignorance of the true nature and objective of our efforts and activities, felt toward Taylor and his disciples.

"All the more gratifying is it, therefore, that so many of them have since seen the light and have come to realize that only through ever-increasing efficient production can the industrial workers of America hope to maintain their higher standard of living against the inevitable strong competition of other industrial nations." [EDITOR]

Testimony of Carl G. Barth

January 31, 1912

The Chairman: Mr. Barth, please state for the record your name and address and your occupation or business.

Mr. Barth: My name is Carl G. Barth; residence, 1937 North Thirty-third Street, Philadelphia, Pa. I call myself a consulting engineer for lack of a more significant term to express my activity.

The Chairman: Mr. Barth, please state for the information of the committee such facts relative to scientific management as you may deem of value to the committee.

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[1] Reprint of public document *Hearings Before Special Committee of the House of Representatives to Investigate the Taylor and Other Systems of Shop Management Under Authority of H. R.* 90, Washington, Government Printing Office, 1912, Vol. III, pp. 1538-1583. The members of the Committee were Hon. William B. Wilson, Pennsylvania, Chairman; Hon. William C. Redfield, New York; Hon. John Q. Tilson, Connecticut.

Mr. Barth: In the first place, let me say that I personally do not use the term scientific management a great deal. I introduce, or help to develop, in machine shops preferably, what I call a Taylor system of shop management.

The Chairman: Then, Mr. Barth, we would like to have you state for the information of the committee what you consider to be the essential features of the Taylor system of shop management and its effect upon production and upon the workmen.

Mr. Barth: I will state that by reading a paragraph from my most recent report on my work at the Watertown Arsenal. This I was asked to make in connection with the strike that led to the more hasty sitting of this committee. I say here:

"The main object of the Taylor System, as I am working for it"—I do not care what the other fellow is working for—"is to so eliminate waste of time, materials, and human energy, and so to utilize the machinery of a plant that a greatly increased production will result in lower cost of production to the owners and, on the other hand, in increased wages to the employees."

That is almost Mr. Taylor's way of putting it, only slightly modified in words of my own.

"And right here I can not refrain from 'letting out of the bag' that I am personally only directly interested in the latter part of this—namely, the increased wages of the employees—and in the former merely because, without bringing this about, the latter can not be brought about. Though I will not deny that I am also intensely interested in the introduction of this system, merely as an outlet for my natural energy and love of work for its own sake."

I want to emphasize that. I do not propose to spend one second of my time to increase the profits of any manufacturer for his own sake. My efforts have been, for the 12 years I have been in this system, to do what little I can do to further the interests of the working classes of society and help to bring them more nearly to the material level I have personally enjoyed for several years past, a level which is higher than I believe myself entitled to; and if there is anything I do that anybody else can point out as not tending that way, I want to give it up at once.

I am satisfied to stay on that level and not to try to get higher because of my personal conception of what success in this life consists in. Most people look upon success and successful men as men who live on a high plane of society and men who make lots of money. I do not care to make any more money than necessary to feed myself and my family and lay by a little, which I must, because you will not pension me, no matter how hard I work. And so I have to lay by for a possible cold day. I might thus get a stroke of paralysis, for instance, almost any time, for I have been burning the candle at both ends, according to the say-so of my physician, and it will not burn forever. I would not work this way if it were not that I believe that I am working in the general direction of human progress and helping along my fellow man. I have been doing that since before I came to this country as a young man 31 years ago.

Mr. Redfield: What have you been doing those 31 years?

Mr. Barth: Working like the devil.

Mr. Redfield: At what?

Mr. Barth: All sorts of things.

Mr. Redfield: Tell us what.

Mr. Barth: You would like to have my life history?

Mr. Redfield: Without going into much detail, we should like to have, Mr. Barth—perhaps I might remind you of the fact that this record is to be read, and people who read it want to know what your experience has been, so that they may judge of the proper value to place upon your statements. Tell us what your experience has been in factories as a workman, or employer, or employee, in any way, which will show how thoroughly you understand this matter about which we are asking you.

Mr. Barth: I received in my native country, Norway, what you in this country consider a high-school education before I entered a small technical school run under the auspices of the navy department, when I was only 15½ years old. I was the youngest pupil ever admitted. It was only a short and purely theoretical course of a year and a half. I graduated with higher honors than anybody ever had done before in that school. It was a course that was absolutely stripped of the numerous fool things with which we spoil technical education in this country. I thank the Lord that I got my education in the old country and not here, and I am very sorry that my children could not have the advantages in education that I had in my native country, and I like to state right here that I consider that every mathematical instinct my children have inherited from me has been killed by the sort of miseducation they received in the primary schools in this country.

Mr. Redfield: We want to know about your training which would qualify you as a judge of the subject we are dealing with.

Mr. Barth: After I had graduated from this school I apprenticed myself in the navy yard. After working about two years in the shops for the second time, such pressure was brought to bear upon me to take an instructorship in the technical school that I finally yielded, greatly against my personal wishes, because I never spent two happier years in my life than when working in those shops. I spent part of the time in the boiler shop and part in the machine shop, and in both places stood exceedingly well with my superiors. I was an instructor in mathematics for half of each day for one year in the technical school and then was in the shop superintendent's office in the navy yard for the other half of the day, after which I was prevailed upon to give my whole time to the school, teaching mathematics in the mornings and mechanical drawing in the afternoons, the following year. However, in spite of receiving my superior's recognition of my services as an instructor, the pay connected with the position was so poor that while I could amply pay my board I could not fully clothe myself, and for that reason I concluded to emigrate to this country to try to get a job that would enable me to earn a complete livelihood, though I was told that in the long run when the hard times would be over, I would have a better chance around the navy yard than anybody else who had been there for many a day in a similar position. Considerable pressure was, in fact, put on me to remain, but I could no longer stand for accepting more money from a father with a large family still on his hands, when I knew that I was worthy of enough remuneration to take care of myself, and so I quit anyhow and came to this country.

Another thing that helped me to make up my mind to come to this country was an experience that made me feel very sore the year I spent partly at the school, partly in the superintendent's office, where, among other things, I had the supervision of the chain testing in the navy yard.

For private parties this chain testing had previously to the hard times been done on overtime, and the supervisor had for this work received the "munificent" compensation of half a crown (about 13½ cents) an hour, while it fell to my lot to do this on regular hours at 10 ore (about 2¾ cents) an hour. This appeared to me very unjust, and on my pointing the matter out to the manager this official took the matter under advisement, only later to tell me, through one of the chief engineers in the navy, who was just then also doing duty in the superintendent's office, that, while he felt that I was entitled to the extra pay that had always gone with his private chain testing, and while he would be glad to give it to me personally, he did not dare to do so, because I might get a successor who would not deserve it.

I have never been able to forget this man for his perverted ideas of good management and justice, and I have mentioned the incident as one of many I could give to show that I have in the past been made fully aware of what it means to work without adequate pecuniary reward. Allow me to add, however, that never for a moment in all my life have I permitted dissatisfaction with my pay to detract from the enthusiasm and energy with which I have always tackled any piece of work intrusted to me; and not long after the incident related the superintendent told the same chief engineer that I ate up work so fast that he hardly knew how to keep me going.

Mr. Redfield: Then you came to America?

Mr. Barth: Yes; I came to America, and with no great ideas about picking up $20 gold pieces in the streets, but merely to try to make money enough so that I would not have to burden my father any longer.

Mr. Redfield: Mr. Barth, I want to ask you to boil this down, if you can. We have to print it all, and it will make quite a good deal.

Mr. Barth: Can I not boil it down later, with your permission?

Mr. Redfield: No; you just boil it down now.

Mr. Barth: Please remember that I don't do this kind of a thing as a regular business.

The Chairman: I think Mr. Redfield is entirely responsible for the situation.

Mr. Redfield: Tell us what your experience has been as briefly as you can.

Mr. Barth: I came to Philadelphia, where I got a position in the drawing room of William Sellers & Co., and I want to tell you just how it happened. I had a friend working for that Company, through whose recommendation I was invited to call on Mr. Coleman Sellers, Jr., now president of the company, to show my examination drawings from the technical school. This gentleman found my drawings so satisfactory that he took them to Mr. William Sellers himself, who declared them to be the finest school drawings he had ever had presented to him. As a consequence I was offered a place in the drawing room of this company at $2 a day to start with. This was more than I could imagine myself worth, however, and I humbly suggested that they better start me off at $1.50 only until they actually found out what I would be able to do for them; but even so, I can assure you that my first week's pay looked pretty big to me.

I got along very rapidly with William Sellers & Co., and my efforts were well appreciated by little voluntary increases in my pay from time to time until I reached $20 per week, after which I had to make a fight for every additional cent of increase I received.

I had in the meanwhile married and gotten a family on my hands, and as the demands on me became more pressing I was made to realize more readily than I otherwise would have done that I was getting more and more valuable to the company; and as this grew on me I got my Dutch up from time to time and made demands for wages more commensurate with my services.

I mention this to show you that I know what it is to have to fight for one's rights, and also because I want to tell you that I have great sympathy for the average man who has not the gumption to fight for his rights the way I have done on numerous occasions; for when my Dutch is up I fight for what I consider right regardless of consequences; and I have as often done this for my fellow man as I have for myself.

I mention this to convince you that I have never represented the management side of any concern as against the workman, for I have always looked upon these as my fellow workmen.

With an intermission of less than a year, I was with William Sellers & Co. nearly 14 years.

Mr. Redfield: What did you do when you left Sellers?

Mr. Barth: I left there during the hard times of 1905.

Mr. Redfield: How much pay were you getting when you left?

Mr. Barth: $3,000 a year; but I could relate an incident that would prove that I could readily have had $4,500 a year, and perhaps $5,000, four years earlier, if I had been as hard after money as some people are. However, as this incident is a reflection on the ability of a past admiral of the United States Navy who stands high in the estimation of the present Secretary of the Navy, it better be left out.

Mr. Redfield: What were you doing?

Mr. Barth: I was chief designer when I left.

Mr. Redfield: Designing machinery?

Mr. Barth: Yes, sir.

Mr. Redfield: What did you do next?

Mr. Barth: I had several reasons for leaving William Sellers & Co. when I did. In addition to working for them during the day I taught mechanical drawing in the Franklin Institute evening schools for six years, and gave private lessons in mathematics during the remaining evenings of the week. After this I ran an evening school of my own for two years, and through this work cultivated a desire some day to become a professor in an engineering school in this country.

With this in view, I gave up further night work for money, and set to work to utilize all my spare time to further improve my theoretical knowledge of engineering subjects.

I also contemplated leaving Sellers and go somewhere else where I could get practical experience in other lines of engineering, so that when I finally presented myself as a candidate for a professorship I might be a strong one. My desire to become a professor came from a natural tendency to instruct everybody less informed than myself, and at Sellers' I was constantly helping the younger men along, a fact much valued by the company.

Accordingly, when the hard times came on, and the company wanted to cut everybody 20 per cent, including a countryman of mine who had worked directly under me for two years, and who had developed to a point where he was worth far more than he was getting, I protested that I thought the only fair thing to do would be first to raise everybody that would have received an increase of pay in normal times, before the proposed cuts were made. When this proposition, after being presented to Mr. William Sellers, was turned down, my sense of justice was so provoked that I made up my mind to leave the company as soon as my contract time, which ran from year to year, was up, if I in the meanwhile could find half a decent opportunity.

I was also sore at Mr. Sellers for his attempt to keep my name off of a very important application for a patent on improvements on Emery testing machines.

I mention this incident to again emphasize the fact that I am fully aware of the injustice only too frequently wrought upon employees by their employers when they are too weak to resist them.

The opportunity to leave came through a friend in St. Louis who got me an offer to go with an engine building concern there, at $2,000 a year—a big come down, particularly as I had saved but little of the $3,000 I had been getting for the past three years—but as engine building was a new field for me, it was otherwise just what I wanted.

Mr. Redfield: With what company?

Mr. Barth: With the Rankin & Fritch Foundry and Machine Co., of St. Louis, a company which, to a great extent through my personal work, was brought up from losing money at the rate of about $25,000 per year to where they were just able to carry themselves; but still under conditions such that, when McKinley's election did not bring immediate revival in business at a time when certain bonds fell due, the stockholders got fighting and tried to freeze each other out, with the final result that the business was closed down and disposed of piecemeal.

Mr. Redfield: How long did you stay there?

Mr. Barth: Just two years.

Mr. Redfield: What did you do there?

Mr. Barth: I had charge of the drawing room, but as I soon gained the confidence of my superiors, I was able to exert a great deal of influence on all the producing departments.

Mr. Redfield: Then where did you go?

Mr. Barth: While waiting for something more suitable to turn up I accepted a temporary position to design some special machines for the water commissioner of St. Louis. I stayed with him about three months, and then accepted an offer from the International Correspondence Schools of Scranton. I remained there about one year and a half and then accepted an offer to teach manual training and mathematics in the Ethical Culture Schools of New York. After teaching there a school year of nine months I received a second offer from Mr. Taylor to take up with some of his work.

Mr. Redfield: When did you first meet Mr. Taylor?

Mr. Barth: A few years after I came to this country, when he was a frequent visitor in the drawing room of William Sellers & Co.

Mr. Redfield: After you got away from the Ethical Culture Schools, did you go with Mr. Taylor?

Mr. Barth: Yes, sir.

Mr. Redfield: What year was that?

Mr. Barth: It will be 13 years ago next June.

Mr. Redfield: 1899. Then you went with Mr. Taylor about 13 years ago at the Bethlehem Steel Works?

Mr. Barth: Yes, sir; however, I was not engaged by Mr. Taylor, but by the Bethlehem Steel Co.

Mr. Redfield: What did you do for Mr. Taylor?

Mr. Barth: I was engaged especially to attempt to effect a more satisfactory solution for the mathematical problems connected with the art of cutting metals and its application to the every-day running of machine tools.

Mr. Redfield: You heard Mr. Taylor's statement given yesterday, as to the development of the art, did you not?

Mr. Barth: I do not think I paid a lot of attention to it because I know all about it without listening to what was said yesterday.

Mr. Redfield: When did you first take up with the Taylor system of shop management?

Mr. Barth: I observed what I came in contact with at the Bethlehem Steel Co., where I was made machine-shop engineer after finishing the special work for Mr. Taylor which I have just referred to. As such I had to do with the reconstruction and respeeding, repairs, and maintenance of all machinery and tools in their large machine shop; and the introduction of the slide rules spoken of by Mr. Taylor. I was practically also chief speed boss.

Aside from this, I paid but little attention to the general management side of the system. But I like to tell you that Mr. Taylor first started me on my special work as a laborer to help run the experimental lathe used in connection with the development of the high speed tool steel and on which numerous experiments were also made in connection with the development of the art of cutting metals. Mr. Taylor wanted me to become thoroughly acquainted with his method of testing tools and making experiments; and inside of two months I took charge of all the experimental work for him and also set to work on the mathematical part of the work.

The problem was one for which it seemed all my previous training had especially fitted me, and inside of another three months the slide rules were developed into practically the same form in which we still use them.

Mr. Redfield: Now, Mr. Barth, have you been engaged for some time in introducing this Taylor system into factories?

Mr. Barth: Yes, sir; I have practically busied myself with nothing else ever since leaving the employ of the Bethlehem Steel Co. in the fall of 1901; that is, during the last 10 years.

Mr. Redfield: Into how many factories have you introduced it?

Mr. Barth: Well, let me begin and tell you how I got into this work. I had no intention, on leaving the Bethlehem Steel Co., when Mr. Schwab took the company over, to go into the system at all; but Mr. Taylor thought that I had shown special qualifications for undertaking the work, and so he got in touch with William Sellers & Co. and persuaded them to engage me to conduct further experiments in the line of the development of the art of cutting metals, with a view of introducing our slide-rule method of running their machines. Additional experiments were needed, because our investigations had up to that time covered only larger tools.

This work at William Sellers & Co. was gone into with a great deal of determination.

Mr. Redfield: They took up the work with a great deal of energy?

Mr. Barth: A great deal of vim, you might call it. The man most interested in the matter was their general superintendent, Mr. John Sellers Bancroft, who, unfortunately, however, left the company when we had only made a beginning, and was replaced by a man who had not the slightest conception of what we were trying to do; so that, when after 15 months of good hard work the experiments were all completed, and a great many slide rules had already been made, Mr. William Sellers, feeling that he was now too old to push the matter through without a superintendent willing and able to do his share of the work, concluded to lay the matter aside for the time being; and as Mr. Sellers died shortly afterwards nothing has since been done there.

Then Mr. Taylor secured me a position with the Link Belt Engineering Co., of Philadelphia, to introduce the mechanical part of the Taylor system, and there to make use of the information for which Wm. Sellers & Co. had paid, which, however, had become our property as well, in accordance with Mr. Taylor's agreement with the company. Other men were at the same time selected to take up the general administrative end of the system, Mr. Taylor's only compensation for his personal services being, that I was to be permitted to be present at all his visits to the works; that is, on the company's time, and hence at their expense.

In a year's time matters took such a turn, however, that it became necessary for me to step in and look after the other part of the work also, so that after a while the whole burden of standing between Mr. Taylor, who did not visit us any too often, and the company itself, in the introduction of the system fell on me, and during the following two years I might have been considered as having served the last part of my apprenticeship under Mr. Taylor.

Mr. Redfield: This was at the Nicetown shop?

Mr. Barth: Yes, sir. I was, all told, with the Link Belt Co. nearly five years, during much of which time I also had other engagements, however.

Mr. Redfield: Now, tell us, taking that as a starting point, Mr. Barth, as briefly as you can, what conditions you found at the Link Belt Engineering Co., what you did there, and what the results were.

Mr. Barth: I can tell you the condition I found was that while the Link Belt Engineering Co. for years had been looked upon as having an exceptionally well-run shop, and they particularly prided themselves on being able to bore holes better than anybody else in the world, I found that from my point of view as gained by the experience I had at Bethlehem, their shop was very poorly run. For two years they had had high-speed steel in the works, but they neither knew how to treat nor grind it so as to get any benefit from it. They had attempted to respeed their machines so as to make proper use of high speed steels; but in so doing they had gotten some machines running too slow while others were running at absolutely ridiculously high speed. The first work I did was scientifically to investigate their machinery, and speed it according to our methods; and we also set to work to show them how to treat and grind according to our principles.

Mr. Redfield: The tools, you mean?

Mr. Barth: Yes, sir. The cutting tools. Besides that, they were absolutely lacking in proper handling facilities, and I had for almost a year and a half a number of draftsmen working with me to get the shop equipment in shape.

Mr. Redfield: What were the labor conditions in the shop?

Mr. Barth: The labor conditions were very satisfactory, as shops usually go. The president, Mr. Dodge, being a broad-minded man, they had, so far as the methods of dealing with men go, good principles, and the men were treated as well as ever I have seen them treated under the old style of management.

Mr. Redfield: How many men were there?

Mr. Barth: I do not remember that. In fact, I never paid much attention to that matter.

Mr. Redfield: About how many?

Mr. Barth: I do not know.

Mr. Redfield: Several hundred?

Mr. Barth: I would say upward of 300, all told. They had both daywork and piecework, and, as far as I remember it, they had guaranteed that any rate set should last a year without being cut. But the method of setting rates was the old, rotten way. I will put it in that way.

Mr. Redfield: Now, tell us what you did with the administrative part.

Mr. Barth: I am not done with the mechanical part.

Mr. Redfield: Go ahead.

Mr. Barth: After getting the machinery in good shape we put two lathe hands to work on the full Taylor system, so far as the shop is concerned. We selected a gang boss, a speed boss, and an inspector, and started in to make an object lesson, in connection with these two lathes, of what we meant by functional foremanship.

The gang boss was responsible for seeing that there always was work ahead for these lathes, that the proper tools were also secured, and he also looked after the men's time.

The sole duty of the speed boss was to see that the men ran their machines according to instructions issued from the embryo of a planning department, consisting of myself as the slide rule man and maker of instruction cards.

The inspector saw that the work produced under the supervision of the speed boss was acceptable. At first there was no time study, but the men received 35 per cent additional day wages for thus working under instructions and direct supervision.

To this beginning with two men, which turned out highly satisfactory in every way, we added man after man, and in the meantime appointed a man from the shop to take up the slide rules under my directions, and little by little we added time study and task work with bonus, for which, later on, Mr. Taylor's differential piece rate was substituted.

Mr. Tilson: Is it there yet in its entirety?

Mr. Barth: Yes, sir; and more of it than when I left, because it has been growing ever since. Only some minor changes have been made in the clerical end of the system.

Mr. Redfield: Was objection made by the workmen to this?

Mr. Barth: In all the time that I was at the Link Belt Co.'s plant I heard of only one man that left because he was dissatisfied.

Mr. Redfield: How long were you there?

Mr. Barth: All told, nearly five years.

Mr. Redfield: Only one man left because he was dissatisfied?

Mr. Barth: Yes, sir.

Mr. Redfield: Did not some men leave of their own accord who might have been dissatisfied without saying so to you?

Mr. Barth: Very possibly, because I was too far up to hear about all those things.

Mr. Redfield: We are very much interested in knowing how this was received among the workmen in the shop.

Mr. Barth: It was received in an excellent spirit by the men. The two men who were used in the introduction of the system were taken into the superintedent's office and talked to by me personally in the presence of the three functional foremen appointed to run them before we started them off —two men to be run by three men—I set forth the whole principle on which we proposed to treat them in the future. One of the two was well advanced in years, a man who had worked with Mr. Taylor years ago, and to whom Mr. Taylor referred yesterday; while the other was a comparatively young man, a graduate of Williamson's Trade School, who had been in the shop for some years. Both went to work in an excellent spirit, and we did not have a moment's trouble.

Mr. Redfield: How about the other men after that.

Mr. Barth: I never heard of trouble with any of them, and it was not very long before men commenced to bother us because we were not able to get around fast enough to put them in a position to make the extra money. There was particularly one man, whom I actually dodged when I could, because the minute I got near him he laid hold of me and wanted to know why I could not get to him and enable him to make a bonus just like the other fellows. He ran the gear cutting machines, and the only reason I did not take him up till late in the game was that the problem was an enormously big one, because up to that time high-speed steel had not been successfully used for gear cutting, and because in that class of work a man is readily able to run a number of machines without overexerting himself. However, this makes it hard to set a just task when there is not work for all the machines a man can run and is really a problem that has no good solution. However, we have found a workable solution.

Mr. Redfield: Now, was there no complaint on the part of any of the men about being speeded up?

Mr. Barth: If there was any, it was not ever made to me, if my memory serves me.

Mr. Redfield: You were there five years. Did any of the men complain that their health suffered or their nerves?

Mr. Barth: Absolutely not.

Mr. Redfield: What was the effect upon their wages?

Mr. Barth: A substantial increase over their day wages.

Mr. Redfield: To what extent?

Mr. Barth: We aimed there for the same thing as at the Tabor Co., namely 35 per cent. Some men earned regularly 50 and 55 per cent, however.

Mr. Redfield: Now?

Mr. Barth: Yes, sir.

Mr. Redfield: Are you familiar with the conditions in the shop now?

Mr. Barth: As much as possible, by paying an occasional visit to old friends.

Mr. Redfield: Are any of the men working there now who were there when you were there?

Mr. Barth: Yes, a great many.

Mr. Redfield: And have they worked without interruption under this system during the years since you were there?

Mr. Barth: I could not say, because since that time there have been very dull times, and I know that while the Link Belt Co. has not been as dull as sometimes before, they have had their share of dullness.

Mr. Redfield: What I meant was, has this system been in uninterrupted use there, so far as it was run?

Mr. Barth: So far as I know. There was a temporary interruption at Link Belt in one part of the system while I was still there, but never any that affected the men after they got started.

Mr. Redfield: Have you not heard of men in that company that were dissatisfied and left?

Mr. Barth: If I have, it has made absolutely no impression on my mind. I have only the most pleasant recollections of the men there. There might have been a few; but if there had been anything disagreeable in connection with their leaving I would have remembered it. Anything disagreeable that happens to a man whose welfare I have at heart sticks to me.

Mr. Redfield: In how many establishments have you since introduced the Taylor system?

Mr. Barth: The Link Belt Co. and simultaneously with it the Tabor Co. were my first experiences, and both under Mr. Taylor's general guidance. Without Mr. Taylor sharing in the responsibility of my work, I first went to the Yale & Towne Manufacturing Co., where I introduced the system in that department in which machine operations were counted the most, the company wishing to try the system out thoroughly in that department before venturing to introduce it into any other department.

Mr. Redfield: Did you have any difficulty with men there?

Mr. Barth: I had the only difficulty I ever have had with any workmen in this work — personal difficulty.

Mr. Redfield: Tell us about it.

Mr. Barth: Yes, sir; I will be delighted to. I was making a personal experiment one day on a lathe, when I found working on the lathe right by me a young man who was turning up a number of axles, small axles of increasing diameter in the middle, and with long journals turned down on both ends. Finding that this man either knew so little about his job, or was so careless or indifferent, that he turned down the journals to a complete finish before he roughed down the middle, I turned to him in a most kindly, fatherly way, and suggested that it would be a far better scheme for him at least to rough down the middle portion of the shaft before he destroyed its original stiffness by turning down the ends. Without my expecting that any living being would take any offense at what I said, the fellow turned on me and said that he did not propose to have anybody tell him how to do his job, because he knew his business.

I answered, "Young man, I did not mean any offense; I only meant to call attention to the fact that there is every evidence now that you either do not know your job, or else you do not carry out your knowledge," or words to that effect. He answered that he was not going to stand for anybody interfering with his way of doing things. By that time I imagine I got a little hot under the collar, and told him that he was making an ass of himself, a thing, however, which I told him, that I had often done myself, and frequently do even now, although I do it less often as I grow older.

Mr. Redfield: Now, you say—is that all there is?

Mr. Barth: No, sir; there is more to the story. It is a fine story. I said to him, "You will soon realize that you are not doing the right thing, and I sympathize with you." He answered that he was going to quit. I said, "Won't you reconsider this thing? I will not let a soul know what has happened, if you will go right back to work." He said, "I probably was a little hasty, but I prefer to leave." "All right," I said, "all right; but let me tell you one of the principles under which we work is this: Do not imagine, for a moment, that you can quit in this department and get a job in any of the other departments in this establishment, as has heretofore been the custom. You cannot do that. You will never, so long as you live—if our system is carried out—get a job in any other department of these works. But any time that you will come back and admit that you did not act right and go back to your job, not a hard word will be said to you."

I got that story a little twisted. That was what I told his foreman to tell him.

Mr. Chairman: It may be corrected in the manner stated.

Mr. Barth: I told his foreman to see if he could not persuade the young man to go back to work. But he left and hung around the city for just one week, believing he could find a way to get into another department, in which the foreman was his personal friend; he had, in fact, already promised him a job before this incident took place.

Finding himself positively shut out, he went to a neighboring town, where he remained for about two months, after which, one day, very much to my satisfaction, I found the young man back in the same shop; and so far as I know he is there today. That is one of our principles. When a man admits he is wrong, we forgive him. We never persecute a man. We all make mistakes, and particularly as I have so often made mistakes myself by being too hasty, my sympathies with younger men doing likewise are very strong. I only feel sorry for them when they behave that way with me.

Mr. Redfield: You say this was the only case you ever had trouble with?

Mr. Barth: Any real difficulty. I would like to tell you about some other experiences.

Mr. Redfield: I wish you would. Make it as brief as you can.

Mr. Barth: The trouble is you cannot always make a long story short. I am not an adept at this kind of thing.

To show you how an ordinary mechanic, as a rule, absolutely does not understand his work—I say as a rule—I will give you further instances from the same shop, and show how we instruct the man in the kindest manner in the world and make him understand that we are his best friends and want to help him and show him. We avoid making him feel that we look down upon his lack of knowledge, knowledge he thought he had in full possession.

I found, in the same shop, a man milling a key seat in a shaft, which, from the particular manner in which the chips came off, my experience told me that it was a very soft shaft, and that, without knowing anything about the work in any other way, it would be possible to make a great increase in the rate of cutting that key seat. I spoke to this man about it, and he said, "I have already broken one tooth in my cutter, so that if I speed up I am apt to break more." I said, "You do not mean to tell me you are running with a broken tooth?" He said, "Yes." I said, "You ought to know better; you ought to go back to the tool room and get another cutter without a broken tooth."

In the meantime I procured my slide rule for milling work and by means of this determined a suitable feed and speed for the cutter he brought from the tool room and then picked out the nearest to these that his machine had. I also sent for the foreman and other witnesses to see what I was doing to instruct the man.

The cutter just obtained was perfectly new, and its teeth were far longer and far more liable to break in case of overwork than the old cutter; but still in a mere fraction of the time previously taken I cut the key seat the full length, to the great astonishment of everybody concerned.

When we came to investigate about the cutter with the broken tooth we found two men in the tool room willing to swear that that particular milling cutter had had a broken tooth for the last two years, while the man at the machine had told me that he had broken it by attempting to do faster work than I found him doing. That is the kind of information we get in the shop, not because the men want to lie, but because there is a slipshod way of talking about matters and doing things. I mean in the ordinary, average shop, while Yale & Towne's was supposed to be a well-run shop; and Mr. Towne was for years among the leaders of systems in this country.

Did I remove from that man his initiative? Did I not merely show him what really could be done, that is, instruct him? And did I not catch him using a broken cutter when he could have had a new one for the asking?

One man watching the whole performance noticed what I did not, namely, that the man, after the cut was finished, stopped the machine and ran the cutter backward over the chips in the seat cut, thereby running the risk of breaking its teeth by a fool move while it was not working. This probably had been the manner in which the tooth had been broken before, and it shows the impossibility of trusting the judgment of the average good mechanic. They often break things by fool handling, and not in doing work.

Still another interesting case happened in this shop during the preparatory period of establishing a planning department and improving the shop equipment and thus before we really had begun to systematically take hold of the shop work.

In this case I showed a first-class machinist how he could run his tool on a lathe 80 times faster than I found him running it. The incident, together with some others of a similar nature, were recently related by me in an article entitled "Betterment of Machine-Tool Operations by Scientific Metal Cutting," which appeared in this month's issue of the Engineering Magazine. I shall later ask to have this article made part of this testimony.

Mr. Redfield: Were you present, Mr. Barth, and did you hear a description of a machine shop attached to a large New England mill in which it was believed by the foreman and by the owner that the shop was a very efficient one, in which it was pointed out to that owner that on a certain shaper this was running one-eightieth of its standard capacity?

Mr. Barth: I do not remember that.

Mr. Redfield: Do you remember that statement being made at Dartmouth College?

Mr. Barth: That particular thing probably escaped me. Lots of things escape me because I am somewhat hard of hearing. However, I can beat that by showing you how I recently had a chance to increase a man's production an infinite number of times. It is not more than six weeks since I was called in to investigate the shops of the Fairbanks Scale Co.

Mr. Redfield: At St. Johnsbury, Vt.?

Mr. Barth: Yes, sir. Going through the shop, I saw all kinds of wrong things, from my point of view. I thus found a man sitting this way (indicating) at a planer, looking at his work and apparently watching the cut. When I came up to him he looked at me, then again looked at his work; and he and I looked at the work together, but without either of us saying a word. And if that man did not feel like the very devil in my presence, and with his foreman behind me, taking a chance as to whether I understood the work or not; for he was only pretending to work, having absolutely no cut on his machine, while this was running idly back and forth. The situation was absolutely painful.

Another case: I was asked by the Chief of Ordnance, a little while back, to go to the Frankford Arsenal.

Mr. Redfield: May I suggest that we are much interested in what became of this particular case, where the machine was running forward and backward and nothing happened.

Mr. Barth: Both the foreman and I sneaked away, but when, on the next evening, I gave an address on the Taylor system before the fifty or more foremen and the complete staff of officers I frankly told them about the case. However, I told them that I did not consider the man nearly as much at fault as the management itself. Those things are always the fault of the management primarily, and only secondarily the fault of the man.

When going through the Frankford Arsenal some weeks ago to investigate the conditions for the Chief of Ordnance and make a report, I found a toolmaker running a shaper on an exceedingly short stroke, with an exceedingly slow speed, and with the finest feed I have ever seen a shaper provided with, so small that I at first thought it a case similar to the one previously related about the planer, but on looking closer I found there was actually a fine thread of a chip. I said nothing, but made a mental note of the matter, and apparently accepted the foreman's voluntary statement that the job was an exceedingly accurate one and the material an exceedingly hard piece of steel. Evidently, he, too, realized the absurdity of the cut, but considered it up to him to make the best of it.

I have here the article I just referred to, recently written by request of the editor of the Engineering Magazine. In it I relate several interesting experiences I have had with my slide rules, and I suggest that it be incorporated as part of my testimony, particularly as Mr. Taylor was asked to give more specific instances of what slide rules had done as against men's judgment.

The Chairman: It will be inserted in the record.

The article referred to is appended herewith.

Mr. Redfield: If you can give us any more examples of the effect of this system upon the health and comfort of the workmen, and their attitude toward the system, we will be glad to have them.

Mr. Barth: I will do so.

Mr. Redfield: I move that all reference to the Government Printing Office be stricken from the record.

The motion was agreed to.

Thereupon, at 10.05 o'clock p.m., the committee adjourned to meet at 2 o'clock p.m., Thursday, February 1, 1912.

Betterment of Machine-Tool Operation by Scientific Metal Cutting

By Carl G. Barth

Mr. Barth was invited by the editors of The Engineering Magazine to furnish transcriptions of some of his records of specific cases in which large gains in output had been secured by applying to metal-working machines the slide rules made by him as an element of machine-shop management under the system he represents—the Taylor system. It was felt that definite data of this kind, even though the records might be of cases not likely to be exactly repeated elsewhere, would be a most practical demonstration of possibilities that are general. Unfortunately, the proposal could not be carried out in that precise form, for this simple reason, as Mr. Barth puts it, that he keeps no records. He adds: "I have never had the inclination to make many personal records of any of the work I have accomplished as a systematizer, because mere records cannot add to the value of that work and because I find it difficult enough to make such necessary records of new knowledge and experience, gained while working for one concern, as will be of further help to me in tackling others—and records of gains made in specific cases by the use of my slide rules would not fall into that class. Besides I long ago became so firmly convinced of and used to the efficiency of these slide rules that even the most astonishing gains made by their use today make no other impression upon me than to make me feel keenly how unfortunate it is that we cannot see our way clear to get them introduced more rapidly."

In lieu of the more formal tabulation, however, Mr. Barth has set down the record of personal experience in a number of characteristic instances, and his reminiscences following carry the closer interest of the familiar atmosphere of the shop and the vitality of an energetic and effective personality —(The Editors.)

In the following notes I shall try to call to mind some specific cases that have impressed themselves on my memory, because there were certain especially interesting circumstances connected with them. I shall take them up chronologically, though without giving date or place of occurrence.

In one place the depth of cut, feed, and speed were all set by the slide-rule man, to be taken by the tool of one of two carriages on a lathe, in rough-turning a large shaft, and the speed boss for the machine most gleefully reported that the belt would not pull this cut; for, rather fresh at the job, he had as yet but little faith in the possibility of predetermining these matters in the office, either by means of our slide rules or anything else, and he tried to "rub this in on us" as often as he thought he had a good chance. After the matter had been referred to the chief speed boss without that gentleman being able to find any explanation of this failure, the case was referred to me.

As we had not at that time in this plant succeeded in fully establishing our system of caring for the belting, I at once suspected, on finding that the surface of the belt was in good condition, that there had been an oversight whereby the tension of the belt had been allowed to fall below the minimum set; though it was not so slack that, under ordinary circumstances, anybody would have had it retightened. And that was what we actually found to be the case when the belt man came and ascertained the tension of the belt by means of his belt scales; whereupon I went back to my office not expecting to hear any more from the matter and feeling that I had gotten a "good case" on the speed boss, who now ought to be satisfied that we knew pretty well what we were about.

However, I was mistaken, for it was not very long before I was again sent for and told that the speed boss again "had it on us," in connection with this very job, for the belt was now able to pull on both tool carriages the cut specified for one carriage only.

Of course, as the slide rules are "tuned" only for a pull that can be safely counted on at the minimum tension specified for a belt running at a certain speed, whenever a belt is retightened to its maximum tension (which is considerably higher than the minimum) it is able to pull a correspondingly larger cut, although it is not possible to take advantage of this circumstance in dictating a cut from the office, as this must be done without any other knowledge regarding the tensions of the various belts in a shop than that they should never be below the minimum tensions specified—except by an occasional falldown on the part of somebody else.

However, when this belt, at its supposed maximum tension, was reported to pull actually twice as much as specified, it seemed rather uncomfortably in excess, and I again sent for the belt man to bring his scales and see if by some mistake or other he had not taken more than he should out of the belt; and though he was unable to explain how he had done so, this actually proved to be the case to a considerable extent.

Our ambitious speed boss, having been a witness to every move made in the matter, finally admitted that it looked as if the slide rules were after all not a mere bluff, as he evidently had hoped to prove that they were. In fact, this proved the culminating point in this man's attitude to the whole slide-rule proposition, so that, before long, he became one of the greatest enthusiasts we have ever had working with us; and as soon as the further extension of the use of the slide rules was made in that shop, he was taken into the office, himself to dictate, by means of the slide rules, the cuts to be taken under the supervision of other speed bosses. Whenever any of these tried to act as he had originally done in the same capacity, he was able to handle them without any assistance of mine, and perhaps better than I could have done, for he was fully "on to their game" since the time he tried to play it himself.

I have mentioned this case principally as an example of the difficulties we always meet with in introducing these slide rules. It is because we fear that these difficulties cannot be properly met and overcome except by men who are possessed of that absolute conviction as to the value and soundness of these slide rules which comes only from growing up with them, so to speak, that we have not to date taken the risk of placing these rules on the general market.

Considering this case as an example of increased output, it goes without saying that, if it had not been for the slide rules the belt would not have been retightened at the time; hence the output of the machine would have been at the very most equal to the pulling power of that slack belt, and probably a good deal less. In addition to this, the exact information and data put on the slide rules had previously been applied in so respeeding this very lathe, along with its companions, that they could all do more work than before.

During the first week in which our slide rules for turning cast iron were put into practical operation in another shop a batch of 18 sheave wheels were put through. Having as yet no line on their hardness classification, we made a guess at this, and then dictated all the cuts and speeds for these wheels by means of the slide rule. The total time allowed was far less than time previously taken.

On the first five wheels everything went well, but then two of them in succession proved so hard that nothing could be done with the cuts and speeds set; the speed boss wanted us to agree to cut the speed down for the rest of the wheels to meet the hardness of these two. However, when appealed to, I objected, and insisted that every one of them be tried as we had started out, and as we had successfully proceeded with the first five—and, as it subsequently proved, we could do with all the rest. Had the shop had its own way, all these wheels would have been turned at speeds suitable only for the hardness guessed at by the shop, which, as everyone knows who has had much experience in these matters, would be bordering on the hardness of previous adverse cases.

A concern that for over two years had used high-speed steel in the shops without getting any material benefit from it wrote to me to come to their shop to show them what high-speed steel would do when fully understood and properly handled. This I agreed to do, stating that the best way of doing it would be by means of a slide rule for one of their best lathes, for which I then requested that they make me a diagram showing all its speed and feed mechanism, and countershaft with pulleys and line-shaft speed. On receipt of this, I found the lathe entirely underspeeded, and made suggestions whereby to increase its speed two and one-half times, telling them also to have ready for me various samples of their customary materials, from the softest to the hardest, in steel, cast iron and brass.

The performance that followed was witnessed by some twenty foremen, who then and there were made to realize that their rule-of-thumb methods counted for nothing as against the science of my "guessing sticks"; for they were made to understand that I had never seen the lathe itself before then, and had become acquainted with its properties only by a study of the diagram sent me. The result was that I was immediately retained by the company.

Later on, in one of the shops of this same company, I had one of my most interesting experiences with a slide rule. After a number of machines had been respeeded and slide rules made for them, but before they were taken into use or the calculations for them even gone over by myself, I happened to see a performance on a lathe that for efficiency was about as bad a case as I had ever observed. Though the time for my interference in a case of this kind was not as yet at hand, it was too much for me, and I somewhat undiplomatically addressed the operator (who was considered, by his foreman, the best mechanic under him) as follows:

"That tool seems to me to be doing very little work, so don't you think it would be well to 'speed her up' some?"

"Oh, that tool is running all right," he answered.

"What criterion have you," said I, "for concluding that a tool is doing what it should?"

"Oh, that tool is running all right," he replied. "You see, it is pretty hard steel."

"I have a very simple, but reliable, criterion," I then told him, "by which I judge whether a high-speed tool is doing what it should or not, in turning steel of any degree of hardness. Your tool is not doing anything like what it can, if it has been properly treated and has not been burned on the grindstone; and if it has, it has no business to be in the shop, but should at once be returned to the tool room."

His huffy rejoinder was: "Well, I understand that you have made the boast that you can show an experienced machinist how to run a machine better than he can, even if he has been at the same machine for ten years, so let me see you do it."

This challenge was rather unexpected and uncomfortable, for, while I had attempted to explain the workings of the slide rules to some of the foremen, and had impressed upon them the fact that the determination of the most economical feed and speed to use in rough-turning a given piece of material is an exceedingly complex mathematical problem, the correct solution of which no man can determine by a guess, except by an occasional providential grant of good luck, still I had done my best not to convey the very thought implied by this man, to whom my little talk to the foremen had evidently gotten around in this perverted fashion, or near enough so, for him to feel justified, when a little annoyed, to "throw it back" at me in this form.

However, realizing at once that it would not do to argue the case, and to try to tell him that I had never said anything of the kind, I unhesitatingly took up his challenge, and said, "Well, I can and I will." Immediately I procured the slide rule for his machine, though not without a good deal of misgiving; for if the tool happened not to be up to standard (which was not so unlikely to be the case, as we so far had only a reasonable assurance that the tools given the men in the shop were all right), and if there had been any mistake made in working up the data for the slide rule for this machine (which, as stated above, had not been verified by me), then I might have made a miserable failure, without any fault of mine or of the slide-rule method of running machines, but yet without much chance of ever setting myself straight with this man, or probably with the whole shop.

However, both the tool and the slide rule proved loyal to me on this occasion as will be realized from what happened next.

After ascertaining the diameter and the depth of the cut of the work, and guessing at the hardness class of this alleged "hard" steel as bordering on that of a very soft grade of machine steel (which I correctly judged it to be by the pulling and tearing action of the tool upon it at the slow speed run by the operator), I set the "guessing sticks" to their proper respective positions, and reading off the feed and speed shown, I turned to the operator and said:

"You have the belt on the middle cone step, with the triple gear in. Leave the belt alone, but throw the triple gear out and put the back gear in; that will increase the speed six to one. Next, you have the feed belt on the slowest feed cone; put it on the fastest. You have the feed push pin in; pull it out, and your feed will become just eight times coarser." He unhesitatingly did what I told him, and I continued:

"Now set the tool to take the same depth of cut and go ahead."

Thereupon he turned to me in the most astonished manner and said:

"But you don't mean that?"

"Indeed I do," I replied, "there is nothing extraordinary about it if only the tool is what it is supposed to be, and I have to take my chance on that."

Giving me a pitying sort of a look, he started the cut off, evidently expecting something terrible was going to happen either to the tool or the machine, and feeling convinced that among all the fools and bluffers he had ever seen "come down the pike," I was the biggest.

However, nothing happened except what always happens when an engineer fully understands his work and has no slip up. The result was what it should be, namely, that the tool ran the full length to be cut under a beautiful blue chip, of a kind which, to be sure, our first-class machinist had never seen before, though by this time high-speed tools had been in use in that shop for over two years, and most of the machinery had for some time been respeeded to make full use of them. All of which counted but for little, as the ordinary shop does not possess the initiative, unaided, to take up with radically new ideas.

As I not only took great pains not to "rub it in" on this man, but also spent considerable time in explaining to him the slide rules to the extent that he was capable of following me, in addition to giving him an idea of their history and development, including my own connection with them, we at once became good friends, and there was never any further trouble in that shop with skepticism regarding the value of the slide rules.

I look upon this case as one of my best samples of the triumph of science over the rule-of-thumb methods of the unscientific worker, who just because he is unscientific further reduces his efficiency by never doing his best; for in this case there was not the slightest doubt that the man knew that he could do a great deal better than he did, even though he did not suspect that he was doing only one forty-eighth of what his tool and machine were capable of.

The three cases cited above happened during the early history of the adoption of high-speed steel, but the following took place less than three years ago. I was called into one of the large navy yards to make an investigation of its machine shops and to report verbally to the commandant as to what improvements I thought it advisable to recommend, and particularly to see if the high-speed tools were being used to advantage.

As usual, I found all belt-driven machines far underspeeded, and as for the motor-driven ones, the few I looked into were the most sickening examples of lack of the knowledge needed to speed machine tools successfully in any manner, that I have ever come across.

As usual, in order to show what tools can do, I picked out a fair lathe and made a slide rule for it, but not until I had ordered the pulley on its line shaft changed from a ten-inch to a forty-inch; or, in other words, I had the machine speeded up four to one, after looking into its properties on paper before I went near it in a material way.

The demonstrations I made, both of what could be done with that slide rule and with the tools as I found them in the yard, were so pleasing to the commandant that he expressed his hope that he might obtain permission to secure my services to respeed all the tools, and to introduce our slide-rule methods of running them; but all that was lost in the general navy washout that soon followed, and the only permanent satisfaction I had of it was that the foreman of the shop in which the demonstration was made, of his own accord and in a similar manner, speeded up several lathes before I paid the last one of my five visits of a day each to the yard; and as I was told that this foreman was one who, while hard to convince, always stayed convinced, I also have reason to believe that he has since made great strides in the use of high-speed tools.

In still another shop the management had under consideration getting some one to help them improve matters; and sending for me, they agreed to engage me if I could convince their general shop foreman that I wasn't only one of "those theoretical fellows," but a man who also fully understood machines and shop work.

I agreed to try to do this, and a job was put up to me to improve on, one on which I afterward found out that every resource of that shop had been put to make the best of it. It was the turning up of certain cast-iron cylinders, sixty inches in diameter and seventy-two inches in length, when finished. These were cast with large sinking heads and were provided with inside flanges for heads.

I first investigated the only lathe in which this work could be done and found it in every way a good one, except that it was not running as fast as it might be run, though the class of work under consideration was of the kind that calls for the slowest legitimate speeding—namely, cast iron requiring the full swing of the machine.

All I could do was fifty per cent, which meant a thirty-inch pulley on one line shaft instead of a twenty-inch. When I had the change made, the foreman said that he, too, could have done better if he had speeded the lathe up, and the manager and I both said that that was so, the manager adding: "And you have had six years to do that in, but you have not done it."

I also designed a new tool holder to get at the inside flanges in a better way and made a slide rule for the lathe, and, besides, brought high-speed tools of my own that I knew were all right, for the case was such that I could not afford to take any avoidable chances.

When everything was ready and I set the slide rule for the average depth of cut that the foremen told me they usually ran into in truing up the cylinder, the diameter, the hardness (as usual, I had to guess at that), and the life of the tool as one hour; the most economical combination shown by the rule was the slowest available spindle speed and a feed of one-fourth inch.

When I announced this, considerable surprise was evinced, for the best they had been able to do was one-eighth inch feed at the original slowest speed, so that I proposed to do the roughing at, all told, three times their rate; and as the tool stood up one hour and fifteen minutes, while I had aimed at one hour, my first point was gained. The second tool finished the cylinder in forty-five minutes; and even greater gains were made in turning up the inside flanges by taking substantial cuts with power feeds, whereas they had been picking away at them with fine hand feeds, for fear of breaking out the flanges, which I at once recognized as strong enough to stand the cuts proposed.

Even in the final finishing on the cylinder, which was a delicate piece of work, I made great gains, so that the total time, including a lot of awkward handling, proved to be just about one-half of their best time, according to the statement of the foreman himself, who, while conservative and skeptical, was perfectly honest.

This is again a good example of the triumph of scientific methods as against mere practical experience.

Again, I was requested to look into an old shop to see whether or not any improvements could be made in the running of the machines; and again I asked for diagrams of two of their best lathes, with a view of making slide rules for them before going near the place. As expected, the lathes were greatly underspeeded. I determined the pulleys wanted for the line shaft and requested that these be put up before my arrival, but they wrote back that there was not head room enough on the line for the pulleys specified. As I could not request that the whole line shaft be speeded up only for my demonstration, I made two slide rules for one of the lathes, one corresponding to its old speeds and the other corresponding to the speeds that would be obtained by the largest pulley we could get onto the line shaft.

This done, I wrote the company to be prepared to have me make a demonstration with the former slide rule in the morning of the day of my arrival, and with the latter rule in the afternoon, and for this purpose to have some suitable material ready.

The lathe, though an old one, was in fair condition and was still operated by the man that had first started it off. He had been informed by his foreman that I was coming and told to do his best in competition with my slide rule, and no doubt only because of this put on a screw-cutting feed of eleven threads to the inch; for where a machine has belt feeds besides screw feeds, I have never found a workman do any better on his own initiative than to use the coarsest belt feed. He also threw the back gear in and put the drive belt on the fastest cone speed, and with this combination he did so well that I hardly thought the slide rule could indicate anything better, for it was evident that the slowest speed without the back gear would not have power enough to pull the cut, though the material was a very soft steel shaft, for efficient work on which the lathe was greatly underspeeded.

However, when I set the slide rule, in the presence of several witnesses it indicated a feed of nine threads to the inch and the same speed, thus showing that the man, even in his unusual efforts to have the lathe do the most he dared to risk, only got eighty-two per cent of its normal capacity, as measured by our standard.

As this operator was exceptionally handy at cutting threads, the backing belt had not been in position for years, whereas I had taken advantage of the two countershaft pulleys to get two forward speeds in making the second slide rule which we set for the same job after putting up the new pulleys during the noon hour.

The rule then indicated the same feed of nine threads in combination with the new fastest speed of the spindle with the back gear in, as I already knew it would, because of the extreme softness of the material that was being cut.

The new speed being about 2.2 times faster than the old, we now turned the shaft 2.7 times more rapidly than the operator had started out to do, or nine times as fast as he would have done if left to his own initiative; for being a good, honest fellow, he subsequently admitted that he would not have changed to a screw-cutting feed when ordinarily doing the work.

He also admitted that he had often thought it might be a nice thing to put up another forward belt on the pulleys originally provided for backing but that he had never gotten even so far as to suggest this to his foreman.

I believe that some of the cases cited above show pretty definitely that it is not wise to leave metal-cutting machines to the initiative of the average good, honest workman, and that our methods of handling such machines are mighty agencies in setting him to thinking in a manner profitable both to himself and the world's production; for surely it is true that we all learn principally by imitating others, and also that we cannot successfully imitate without thinking and reflection.

(To be continued in the next issue)

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Employment Age Limitations

Abstract of Discussions at a Meeting of the Eastern Massachusetts Section of the Taylor Society, Boston, April 5, 1929

IS THERE a vital problem in connection with the retention of or hiring of people of middle age and over in gainful occupations?

The results of a survey of ninety-seven Massachusetts plants of various size were presented by Mr. Noel Sargent.[1] He stated that all have adopted some plan of group life insurance. "Eighty-seven do not discriminate against old employes, nor do they have any age limit. Age limits where they do exist are ascribed to the heavy nature of the work involved. It is interesting to note that practically half of the discrimination which does exist is out of regard for employes and not because of any harsh or arbitrary position taken by management as a discrimination in any sense. One of the big problems is to find something for the old employes to do when their efficiency begins to fall off."

On the other hand Mr. Clement Schwinges[2] maintained that while cases under which employes are actually discharged under an age limit system are rare, some firms make a practice of freezing out older employes, especially when resignation on the part of employes cancels an existing insurance or pension on the part of the employers. "But," he continues, "the list of employers who are willing to judge applicants on their past performance and experiences plus their expected productive capacity, regardless of so-called 'age,' is increasing constantly. The age limit will last no longer than other senseless fads."

Miss Adele Howe[3] stated that not only did this type of discrimination apply to the laborer but to the professional man and executive as well.

"A type we have not stressed tonight is the men who emerge out of mergers. There is a high turnover among high executives. I have had five such applicants within the last few days for minor positions. Two of the men were around forty. They were dropped out because of mergers and could not find work. Except in special cases preference seems to be from thirty-five to forty for executives; thirty for sales managers; and forty for accountants and engineers."

Miss Howe suggested the following remedies for the situation:

"First, help in educating those individuals who need to be brought up to date.

"The second step we feel would be to have a vocational advisor—or possibly more than one—who should interview and advise individuals, referring them to the proper sources for help, whether they should be employment agencies, social organizations or business houses which will take older people. In cases where re-education is necessary the advisor should point this out. The vocational advisor should spend at least half time in field work and become a real clearing house for information.

"The third step we felt was in putting out propaganda which should bring the whole problem clearly to the attention of the employer."

The position of the American Federation of Labor, according to Mr. Frank McCarty,[4] is:

"We are in entire harmony with everything that stands for progress. We maintain that scientific appliances shall not eliminate humanity from industry. When lines are drawn against men, in particular those of forty-five years and up, it is one of the most inhuman actions. Death—whether through their inability to apply themselves to a craft, or by bullet and bayonet! Soul starvation! They are men who are at the height of their skill and thoroughly reliable; men who take pride in their work. There is no excuse for depriving them of work. It verges on the barbarous. Let the leaders stop, listen and think, and ask themselves what we are coming to. The statement has been made that other openings may use up those who are put out of certain lines of industries. New industries *have* opened up in the past few years, and immigration *has* been restricted; *but* there is a very small decrease in unemployment figures. There is no reason to believe that there will be any immediate decrease in the number. With the rapidity with which they are putting machines into various industries and eliminating all forms of manual labor, if we forecast the future in the light of the present, we have every reason to believe it is going to be worse rather than better. So, the American Federation of Labor asks the leaders to keep in mind a value of humanity. This is not a cold-blooded proposition."

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[1] Manager of Industrial Relations Department, National Association of Manufacturers, New York City.

[2] President of the Action Membership Corporation, New York City. Argument submitted in manuscript.

[3] Chairman, Service Committee, Zonta Club of Boston.

[4] General Organizer, American Federation of Labor, Boston.

Professor Elliott Dunlap Smith[9] pointed out that many times management is at fault. Age is less likely to be a factor in employment in firms which have the habit of continuous effort to keep up to date—continuous betterment of facilities and methods—than in firms which allow themselves to get behind and then have to make radical changes quickly.

"Where there has been continuity of job requirements, the formation and improvement of habits of skill of mind or hand usually more than compensates for any loss in inherent nimbleness. What has been learned outweighs any loss of capacity to learn.

"In those trades and professions where the fundamental requirements have remained stable workers command their highest wages after middle age.

"Wherever you find continuity in the development of a business by management, you find that the people, through the laws of habit, have much time to perfect their practices and to acquire skill whether of mind or hand; e.g., machinist trades in their various forms. Henry Ford in his airplane factory still uses machinists as machinists. His own secretary said, 'We have no young people here; these are all skilled men.'

"At General Motors, they treat machinists as machinists. There are almost no young men. The skilled workers are middle-aged craftsmen.

"This is true in the trades where there is a large amount of trade knowledge and a great field of manual aptitudes which takes years to acquire. This is true in the simpler things. As long as there is unbroken continuity from the past, the men who carry home the highest wage from piece work are heavily burdened with years. You very rarely see men in the twenties with large pay envelopes; men in the forties and sixties are those who command the greatest openings. Acquired skill resulting from continuity with the past is worth a great deal more than the mental alertness of college graduates.

"Even where there have been fundamental developments of job and job requirements, if there has been continuity of development, middle-aged workers have been able to adapt themselves to the change.

"Where there is continuity large changes may be brought about gradually and without involving any great amount of learning at any one time. The difficulty of learning is largely dependent upon the amount of change that must be made at one time. Where there has been continuous job development, the learning faculties of the workers in regard to their methods of work do not atrophy but are kept alive by exercise. Recent psychological studies suggest that learning capacity, if exercised in regard to a particular field, can be kept at approximately full vigor well on in middle age. Where change in personnel requirements is gradual much of it will be cared for by the normal replacements in working crew.

"In selling and in managing, as to which there has been exceptional job development in the past two decades, in those concerns where this development has been continuous and the salesman or manager continuously exposed to it, middle-aged people still hold the principal positions. In the textile field as long as the change has been continuous, you find people in middle age earning the largest incomes because they are the quicker and better employes.

"If development of jobs is sporadic and involves abrupt changes, obsolescence in middle age tends to result. Such abrupt changes usually occur only after a period of stagnation. During such a period of stagnation, obsolete habits are strongly developed, and the middle-aged worker is confronted with a task of unlearning, even more difficult than that of learning. During such a period of stagnation, learning capacity in regard to work atrophies. Such abrupt changes involve extensive learning at one time.

"Thus, where departments or factories have been allowed to stagnate, middle-aged or even youthful managers are usually unable to qualify after a scientific reorganization. Likewise, middle-aged employes fail to make the adjustments that employes of equal age make where job development has been continuous." Examples of this may be found in "the rejection of middle-aged managers and employes following methods reorganization in recent years, obsolescence of middle-aged workers following shift to specialized 'production' methods of paper box making in a factory that has made these boxes for half a century by old-fashioned craftsmen methods.

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[9] Professor of Industrial Engineering, Yale University.

"The rub comes when you have jumps, usually in the wake of a failure in management. When one makes twenty-year changes within two or three years, you cannot use the old employes. If the factory has been allowed to fall behind and decline, and you then try to make a change, it is almost impossible. You cannot expect a man to unlearn all he must, in order to fit into the new regime. Where you have had continuity in the scientific application of management, although you may carry the change much further and it be much greater, there has never been any fundamental change to which the man has been unable to adapt as it was made.

"Obsolescence in middle age is thus not primarily a result of inherent deficiencies of middle age that render it incapable of meeting the demand of present-day industry. Its solution is largely a problem of applying scientific management scientifically and not in a haphazard way; of preventing periods of managerial stagnation followed by spurts of development. In the application of scientific management, if it is to avoid middle-age obsolescence it is thus important to be not merely brilliant but consistently progressive.

"This problem of middle-age obsolescence does not arise because people in middle age cannot work well. It takes extraordinary skill to do things on a large scale. It is the rare person, young or old, who can make the jump. The only advantage the young person has is that he has so much less to unlearn. So it really is not education. We do not create abilities in school. All we create is a capacity to acquire them.

"The answer is not anything that comes within the scope of outside agencies, except to relieve. It comes from leadership within and recognition on the part of scientific management that it is not enough to be brilliant. Progress must be made continuous rather than spasmodic."

The problem of unemployment is one of economic irregularity in the opinion of J. M. Matthew.[6]

"The business policy of the past six years has been one of careful buying and conservative inventories on manufactured stock. Liberality as to wages and profits has been so meagre as to have given rise to the term 'Profitless Prosperity.' And still the unemployment problem looms larger and more dangerous.

"Is not the answer to be found in this long period or secular swing, with problems the like of which we have never encountered before. The War suddenly gave us a creditor position, it gave us a gold balance, easy money, the possibilities of immense expansion. We now produce in seven months what the domestic market can consume in twelve. We have surplus and a difficult outlet. If a man has twelve cans of corn on his shelves and can sell ten of the cans but not the other two, his sales activity is profitless because his profits are wrapped up in the last two cans. If nationally speaking we produce more than the domestic market can consume and have great difficulty in 'outletting' our surplus on a depleted foreign market, then our condition is one of terrific domestic competition—with a falling or stationary price level at best, and profit margins which can only be protected by consolidation, mass production, scientific management and mechanical technique. And there walk out your additional million employes. But since mass production necessitates mass distribution and since domestic markets are already exploited to the limit and foreign markets still 'deplete,' we find ourselves in a predicament indeed with a final solution lying in the direction of international adjustment—and this unfortunately is the weakest side of the American people."

A. W. Donovan[7] maintains that "It is not alone a question of employment. Men forty-five years of age and over are a large portion of our market, our consuming public. A large percentage are bread winners for families. Their earning power determines the purchasing power of several times their number. Consequently, the employment of men forty-five and over is a far-reaching problem to American industry, especially if failure to solve it means ultimately cutting down the size of our markets and materially lowering our standards of living.

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[6] Economist, Babson Institute.

[7] President and Manufacturing Director, E. T. Wright Company, Rockland, Mass.

"Considerable can be said on this subject from the viewpoint of its effect on markets. Almost a third of the total male population of the United States is forty-five or over. Each year the ratio of this group to total population increases as the average life-line gradually lengthens. If the ability to hold a job past forty-five or to secure employment at this age becomes questionable largely because of age, that fact alone will have a serious effect upon buying habits of the younger men, especially in the few years prior to the 'dangerous age.'

"Publicity given this subject in recent years reveals the fact that men in all walks of employment are becoming conscious of 'discrimination' against them; 'age consciousness' from this cause will inevitably influence the pocketbook activity of men long before they reach that point.

"It is to the best interests of industry as a whole, and therefore a responsibility, to safeguard the buying power of the nation. In spite of the increased output of industry, the market represented by wage earners is decreasing, due to improved methods and increased efficiency. A statement issued by the Department of Commerce points out that the value of production during the years 1919-25 increased 28.6 per cent."

Moreover, he believes that management often overlooks the real value of age to a business: "Men of forty-five and over, as a rule, display poise in industry. They don't crack under pressure. They don't strain unduly under speed. They don't give up easily, and they have sense enough not to lay out more work for themselves than can be capably accomplished.

"Engineers tell us that a motor car uses less gasoline when driven at a steady rate of speed. Measured speed seems to achieve distance as fast and much more safely than extremes in driving.

"The behavior of men is fashioned much after this. Poise is the product of all those human qualities which come out of rich experience. Age minimums set by law for our congressmen, senators, chief executives, federal judges, witness to the belief of our forefathers that poise is a hand-mate of age. There is a place for this rate quality in industry. Perhaps we are too much given today to a constant effort to break records. Certainly we have over-emphasized the values of youth, important as they are. If families of children need fathers, if a political party needs a party whip, if a bowling team needs an anchor man, if a baseball club needs coaches and a manager, if assembly lines need foremen and inspectors, if corporations need boards of directors, then industry needs the balance, perseverance, maturity and poise of age. As Dean Gauss of Princeton University has said:

"'The obvious contribution which men of forty-five and over make to industry, which younger men cannot make, is the advantage of maturity. We have all learned that there is no school whose discipline is as rigid and whose teaching as long remembered as the school of experience. What older men are inclined to lose in the way of vision they generally compensate us for in the form of balance.

"'I have seen men in a foundry under extreme pressure to produce a given number of perfect castings against a time limit. I have seen a group of young men assigned to turn out such an unprecedented amount of moulding. In their eagerness and almost rash determination to secure a ladle of liquid metal from the cupola and pour it into a mould, they poured enormous volumes of metal, but they did the job carelessly so that the loss in defective pieces more than offset the great increase in number of castings produced.

"'I have seen the foreman introduce a dozen old-timers into a group of one hundred men working under the same pressure. The quiet, steady performance of these men, and their counsel to the younger ones to make haste slowly came nearer producing the result than the impetuous speed of the younger men.

"'Men of forty-five and past persevere. This statement may appear inconsistent with some of the value claimed above, yet even though older men have discovered human limitations, they have at the same time unfolded for themselves the undeniable result of attacking a job and staying with it until it is complete.

"'An officer in an Ohio concern employing about a hundred workmen states that men of forty-five and over are more loyal and more dependable than younger men as a class. Although this man is still well under forty-five he adds that industry owes men of forty-five and over a decided obligation, and morally and economically, industry must shoulder that obligation.

"'Certainly it is always much better to have a man employed than to have him idle, a thing which reacts to the credit of the city in which the industry is located, and certainly regardless of the type of city or industry, there must be jobs that these men can fill. If leaders of industry assume such responsibilities individually and co-operate one with another in a collective way, so that men can perhaps be transferred from one industry to another, when openings afford themselves the situation can be very easily handled.'"

The following statistics (Tables I and II) and explanation by Mr. Roswell F. Phelps[*] tend to prove that in Massachusetts the male is not discriminated against until the age of fifty-four and the female some time later than thirty-five.

TABLE I. RECORDS OF PLACEMENTS OF APPLICANTS FOR EMPLOYMENT AT THE FOUR MASSACHUSETTS PUBLIC EMPLOYMENT OFFICES—BY SEX AND AGE GROUPS AND CONJUGAL CONDITION OF FEMALE APPLICANTS
1928

Offices	Males		Females				Totals	
			Single		Married		Married and Single	
	Under 45	45 and Over	Under 35	35 and Over	Under 35	35 and Over	Under 35	35 and Over
a. Number of Applicants Registered:								
Boston (Main Office)	6,721	851	1,119	264	373	681	1,492	945
Boston (Mercantile Office)	2,111	173	3,473	84	189	163	3,662	247
Springfield	2,757	638	836	456	374	292	1,210	748
Worcester	1,791	411	652	157	140	206	792	363
Totals—Four Offices	13,380	2,073	6,080	961	1,076	1,342	7,156	2,303
b. Number of Applicants Placed:								
Boston (Main Office)	4,725	638	696	188	225	467	921	655
Boston (Mercantile Office)	339	12	920	67	37	6	957	73
Springfield	1,689	360	218	148	157	152	375	300
Worcester	615	134	191	70	80	126	271	196
Totals—Four Offices	7,368	1,144	2,025	473	499	751	2,524	1,224
c. Percentages Placed.								
Boston (Main Office)	70.3	75.0	62.2	71.2	60.3	68.6	61.7	69.3
Boston (Mercantile Office)	16.1	6.9	26.5	79.8	19.6	3.7	26.1	29.6
Springfield	61.3	56.4	26.1	32.5	42.0	52.1	31.0	40.1
Worcester	34.3	32.6	29.3	44.6	57.1	61.2	34.2	54.0
Totals—Four Offices	55.1	55.2	33.3	49.2	46.6	56.0	35.3	53.2

Placement of Male Applicants

Of the 13,380 male applicants under 45 years of age, 7,368, or 55.1 per cent, were placed, and of the 2,073 males 45 years of age and over who were registered, 1,144, or 55.2 per cent, were placed. It would, therefore, appear that, on this broad basis of age division, there was apparently no discrimination on the part of employers against males 45 years of age and over in favor of those under 45 years of age.

This comparison leads to the conclusion that the point of demarcation in the matter of discrimination on the basis of age does not actually occur at the age of 45. A further analysis of the data was made in order to determine at what point, if any, the point of demarcation does occur, if it is true that older employes are discriminated against. A more detailed classification of the records for male applicants for employment was then made and the following age groups were selected, namely: under 25; 25-34; 35-44; 45-54; 55-64, and 65 years of age and over. For the four offices combined the percentages for the first four of these age groups were: 55.1, 55.3, 54.7 and 59.5, respectively, showing little variation when compared one with another. To some it may be surprising that the highest percentage of those placed of the total number registered for any of the six age groups occurred in the 45-54 group. For the age group 55-64, the percentage was 42.9 and for the age group 65 and over the percentage was 28.6. It would appear, therefore, that it is much more difficult for men 55 years of age and over to secure employment than those under 55, and for those over 65 the opportunities for securing employment are relatively few.

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[*] Director of Statistics, Department of Labor and Industries, Commonwealth of Massachusetts.

TABLE II.—RECORDS OF PLACEMENTS OF MALE APPLICANTS FOR EMPLOYMENT AT THE FOUR MASSACHUSETTS PUBLIC EMPLOYMENT OFFICES—BY AGE GROUPS
1928

Offices	Males						Totals—Males All Ages
	Under 25	25 to 34	35 to 44	45 to 54	55 to 64	65 and Over	
a. Number of Applicants Registered:							
Boston (Main Office)	2,661	2,394	1,666	703	145	3	7,572
Boston (Mercantile Office)	1,087	714	310	112	52	9	2,284
Springfield	894	1,023	840	472	143	23	3,395
Worcester	605	658	528	289	108	14	2,202
Totals—Four Offices	5,247	4,789	3,344	1,576	448	49	15,453
b. Number of Applicants Placed:							
Boston (Main Office)	1,982	1,664	1,079	547	89	2	5,363
Boston (Mercantile Office)	218	92	29	11	1	0	351
Springfield	541	647	501	280	71	9	2,049
Worcester	149	247	219	100	31	3	749
Totals—Four Offices	2,890	2,650	1,828	938	192	14	8,512
c. Percentages Placed:							
Boston (Main Office)	74.5	69.5	64.8	77.8	61.4	66.7	70.8
Boston (Mercantile Office)	20.1	12.9	9.4	9.8	1.9	....	15.4
Springfield	60.5	63.3	59.6	59.3	49.7	39.1	60.4
Worcester	24.6	37.5	41.5	34.6	28.7	21.4	34.0
Totals—Four Offices	55.1	55.3	54.7	59.5	42.9	28.6	55.1

The effect of the representation of important industries in the several districts served by these offices may be observed by comparing the records for several offices.

At the Springfield and Worcester offices, where many of the applicants for employment seek positions in the metal industries, a larger proportion of those under 45 years of age were placed than of those 45 years of age and over, but at the main office in Boston where there is a greater diversification of industries, the reverse is true. At the mercantile office in Boston, however, a much larger percentage of male applicants for clerical and office positions under 45 years of age are placed than of those 45 years of age and over.

Placement of Female Applicants

In the preliminary announcement of the topic to be discussed at this conference, the age limits specified were 45 years of age and over for men and 35 years of age and over for women. In order that the records with reference to the placement of female applicants for employment might conform with the age limit mentioned in the announcement, the data with reference to female applicants have been classified in two general groups—under 35 years of age and 35 years of age and over. Of the 7,156 female applicants under 35 years of age who registered for employment, 2,524, or 35.3 per cent, were placed and of the 2,303 female applicants 35 years of age and over, 1,224, or 53.2 per cent, were placed. A comparison of the percentages placed indicates that at the State Public Employment Offices a much larger percentage of the females 35 years of age and over were placed than of the females under 35 years. Evidently, therefore, the point of discrimination on the basis of age was not at the age 35. This may be due, however, to the fact that of the women placed a large proportion was placed in domestic employment and a relatively small percentage was placed in manufacturing establishments. Even at the mercantile office in Boston, which is engaged primarily in the placement of females in offices and stores, the percentage of those under 35 years of age who were placed (26.1) was only slightly smaller than the percentage (29.6) of those 35 years of age and over who were placed.

There may have been some understatement of age by the older applicants, but the fact that those 35 years of age and over admitted the fact quite firmly establishes the reliability of the content of that group. It may be true, however, that the number included within the group under 35 years of age was somewhat increased by the inclusion of a fairly large number who understated their actual ages and this may account in some measure for the smaller percentage of placements in that age group.

While conjugal condition of female applicants for employment may have no direct bearing on the problem under consideration it is of interest in this connection, and the results of the tabulation by conjugal condition are therefore briefly discussed. Of the female applicants for employment who were single, 33.3 per cent of those under 35 years of age were placed and 49.2 per cent of those 35 years of age and over were placed, while of those who were married, 46.6 per cent of those under 35 were placed and 56.0 per cent of those 35 years of age and over were placed.

In the matter of placement of female applicants for employment by the State Public Employment Offices it is evident that, *in general,* there was not any marked discrimination by employers against married women in favor of single women. This statement, however, is not true with respect to the placements made by the mercantile office in Boston which, as has been stated, is primarily for the placement of employes in offices and stores. At this office, 26.5 per cent of the single women under 35 years of age were placed and 79.9 per cent of the single women 35 years of age and over were placed, whereas only 19.6 per cent of the married women under 35 years of age and only 3.7 per cent of the married women 35 years of age and over were placed. In other words, in stores and offices there is marked discrimination against married women of whatever age, but particularly against married women 35 years of age and over.

Honors to Members

At the Third International Management Congress held two years ago in Rome, the Polish delegates presented Mrs. Frederick Winslow Taylor with a testimonial which was inscribed as follows:

To Mrs. F. W. Taylor

The Devoted Companion of a Great Man

The Polish Soldiers of His Ideals

The signatures of Professor K. Adamiecki and twenty-two others were attached.

Two of our distinguished French members and a past president of the Taylor Society have recently been the recipients of exceptional honors abroad. M. Charles de Freminville, newly elected president of the International Committee on International Management Congresses, has been made a Chevalier of the Legion of Honor. M. Henri Le Chatelier is the first recipient of the medal for distinguished service awarded by this Committee, and Morris Llewellyn Cooke has been made its American vice-president.

Personnel Research Federation Meeting

John Dewey, Elton Mayo and Stuart Chase are to speak at the meeting on November 15 and 16. Especially significant will be a report by G. A. Pennock on an experimental investigation of working conditions, rest pauses and other influences affecting individual variations of output of factory workers, which has been in progress for two years in the Hawthorne Works of the Western Electric Company. A plan for improving employe relations, based on data obtained from employes which grew out of these researches, will be described by M. L. Putnam. For full details address the Personnel Research Federation, 29 West 39th Street, New York.

Sales Quotas

A Review[1]

By **CHARLES P. STAUBACH**
Marketing Counsel, Glen Ridge, N. J.

THE book undertakes to assemble and organize, for sales and other executives—also instructors in marketing and sales management—a considerable amount of information not hitherto available in concentrated form.

Following brief discussion of kinds of sales quotas, their uses and the theory of quota setting, the quota subject is handled in considerable detail from the standpoint of market analysis, indices and the company angle. The many illustrations given, with accompanying forms, are drawn from plans in past or present operation. Examples are given of formulating quotas for particular industries. A very comprehensive cross index to the entire subject matter is supplied.

Observations as to the "why" of sales quotas are replete with ideas that are of great interest and essential to an understanding of what a working quota plan involves as to bases and desirable functions. The statements made will be endorsed, in the main, by those who have studied the subject and have had a measure of practical experience with market analysis, general and territorial, including translation of established facts into workable quota schedules.

An exception must, however, be registered to acknowledgment of any difference between territorial and salesmen's quotas which would permit adjustment of territory values to meet the relative ability or experience of salesmen assigned. The suggestion of separate territorial and personal quotas, to be fitted together to form the sales quota, temporizes with the principle that proper quotas can be based only on actual sales possibilities. Also, setting a minimum figure of sales volume to cover selling costs is a plan open to question, or at least to further explanation.

In discussing "control," reference is made to cases where the company assigns quotas to branch managers, "who must attend to the details, if they care to subdivide this quota." Here is an opportunity to point out the inefficiency of any such method. Subdivision should be part and parcel of the entire quota plan, and be obligatory, based on definite territorial information used in obtaining the branch quotas with which the branch managers should be supplied. Their report of individual quotas assigned should balance with county quotas set by the company.

With these exceptions, most of this portion of the volume can be termed instructive, constructive and fundamental and therefore well worth not merely casual reading, but close study before proceeding.

The Market as a Quota Determinant

"Statistical method and forecasting." Illustrations of market information material obtainable from outside sources amplify the text, including charts for display of territorial or commodity results as compared with quotas and general evaluations. Significant comment includes reference to the need of "a certain amount of horse sense in setting sales quotas," as well as care in the choice of a trained statistician or other person equipped with knowledge, skill and impartiality, to be entrusted with the task of making up and maintaining the sales quota. It is frankly stated that a quota system, newly introduced, may be somewhat inaccurate at first but, by gradual correction and living with, it can be developed into an instrument of considerable precision.

"Territorial Market Analysis." Here are practical suggestions as to preliminaries and methods for small as well as large concerns. Market analysis and quota setting are not the same, but importantly related. Various kinds of available analytical information are indicated and information is given as to where they may be procured.

Particularly interesting is the question of proper geographical units to serve in establishing quotas. "Trading areas" are recommended as ideal because variation of their values for the particular commodity can be handled with a reasonable degree of accuracy. Subdivision of these trading areas is, however, necessary to establish individual territories and their quotas; the county is the logical subdivision. In handling trading areas, also, it must be remembered that factors of values, or ratios should often not be the same in all trading areas as for country-wide application. Much might have been said on this subject.

"Types of Market Indices." These are described and discussed in a helpful way, including population, income tax returns, value of products, automobile ownership, telephones, magazine circulation, trade activity, retail outlets, business enterprise counts and buying habits. Trends can be weighed by charting company results over a period, by localities, and comparing them with the percentages obtainable under each type of index, to bring out the relative possibilities of each index as a factor in quota distribution to each industry, thereby indicating, to some extent, those to be disregarded or utilized.

"Combining and Weighing Indices." The illustrations cover many interesting combinations and methods of translating indices into percentages. While more comprehensive, elaborate and technical than many organizations would need to use, these illustrate how far one can go, if necessary, to overlook no possible consideration.

The Company as a Quota Determinant

"Product and Company Analysis." The product, its peculiarities, the exchange problem, product use, distribution method used or to be used, and the production, sales and financial departments are herein considered.

"Sales Analysis." Necessary to any reasonable quota structure, this has the advantage of simplicity and ease of accomplishment. This is one of the most interesting chapters of the book, handling practically without gloves the weakness of so many of the quota setting methods in use, including principally those based on guesswork, salesmen's estimates, arbitrary increases and territorial expense; to which might have been added compromises and adjustments of many sorts.

The Quota in Operation

"Dividing the Sales Quota." Here there is room for some adverse criticism. The author's assertion that "the sum of the individual quotas should be larger than the final quota, thus allowing for failure on the part of any one man to fulfill his quota" perpetuates an old idea, of no practical value, that has been used and discarded in practice. All individual quotas as well as sales should exactly total the branch figure, and all branch quotas should total the company quota exactly, to insure figure accuracy and establish desirable comparisons between the division and subdivision and the company.

Also disagreed with is the suggestion that proper quotas, as to sales possibilities, having been established, any adjustments should be made within the period. If abnormal business conditions arise in any particular section, the normal quota should remain as a matter of record. If desired, an entirely separate tabulation can be made up at the Home Office, based on standard quota plus an adjustment for advance or recession of general business in the section. Regular quotas should be disturbed in no other way. Nor does it seem advisable in any sound quota set up to reduce, as recommended, the quota of a territory when a new man takes hold. The quota should be and remain, based on the territory and not on the man. Temporary adjustments of any kind are dangerous and not to be recommended.

Aside from these observations, only praise can be extended to the author for the valuable information and suggestions contained in his chapter on quota division, which also covers such vital subjects as size of territories, reduction of territories, etc. The illustrations of "combining methods," however, are not quite up to date, though interesting as methods.

"The Sales Force and the Quota." Limited space is devoted to the exact subject. A side trip is taken into the subject of remuneration, with or without reference to the quota. If used as a basis for remuneration, by any chance, it follows that the quota must have been previously tried and proved. The chapter is devoted largely to analysis of salesmen's time, number of calls to be made, salesmen's reports and clerical work, office help for the salesman and general sales activity and control.

"Incentives for the Sales Force." Here again is found only partial tie-up with the quota; rather a consideration of such subjects as compensation types—salary, commission, bonus, task and compensation—with incidental reference to expenses. In this section, space is also devoted to sales conventions, capitalizing the competitive spirit, fundamentals for sales contests, the honor club idea and kinds of prizes that appeal. The quota basis is referred to in treating contest activity. Another reason why the quota should be properly set, on known factors, is that it may be satisfactory to the contestants. The treatment of the entire contest subject should particularly interest and help those who favor periodical contests, not only to stimulate sales,

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[1] *Sales Quotas.* By Percival White, Harper & Brothers, New York, 1929, pages viii, 254.

but also to carry along in business the competitive impulse that the American has in him from boyhood on. The chapter might have stated that, as all territories cannot be equal, a contest must be on a handicap basis, with quota as the only fair "official handicapper" possible to find.

"Installing the Quota System." Brief suggestions are given, with due reference to the mistakes that have sometimes been made in what could, with greater care, have been smooth and effective installations.

The final chapter of "Sales Quotas" covers examples of quota practice, presented as illustrations, without particular endorsement.

The case with which the book closes serves to show how the manufacturer entered upon a survey of his potential market and made up tentative quotas, subject to experience in actual operation.

The author has handled a very large subject in a remarkably painstaking and comprehensive manner. The book should not merely be read and reread, but be closely studied and the page margins marked by the individual for frequent reference.

Reviews

F. W. Taylor, der Vater wirtschaftlicher Betriebsfuhrung. By Irene M. Witte, C. E. Poeschel Verlag, Stuttgart, 1928, pages 100.

Publisher's note on title page:

"Whosoever wishes thoroughly to acquaint himself with the origin of and the fundamentals of the present day efforts to rationalize management, and who on the basis of the knowledge of these sincerely wishes to reach a correct understanding of the problems of organization in their entirety, should by all means acquaint himself with this fluently written book."

To this statement the reviewer gives his most hearty approval, even to the extent of suggesting that a translation of the little book into English would be worthwhile. Comparatively few people have taken the time to read Copley's more voluminous biography of Taylor, on which and on Taylor's own books the author has principally drawn, after a diligent search through an extensive Taylor literature only to find this to be but little more than a useless repetition of the same original material.

A more unbiased and impartial judgment of Taylor and his life work cannot well be conceived, and that though the author was fully aware of Taylor's prejudice against the German people in general. It can be confidently asserted, however, that Taylor never manifested this toward any of the Germans that visited him.

The author tells us that not only was exception taken in Germany, as here, to the designation "Scientific Management" for what had earlier been known as the Taylor System, but that in certain quarters the designation met with almost contemptuous ridicule. However, she bravely defends the designation on the same ground as Taylor himself; namely, because it was the most significant term of which he and others with whom he consulted could think at the time he was ready to publsh the principles of his system which he wished to rid of his own name.

It is all the more interesting that the author has translated "scientific" in Taylor's post mortem designation, Father of Scientific Management, by a German word of comprehensive meaning, including economic and thrifty, a word of which the reviewer believes Taylor himself would have fully approved had it had an exact English equivalent. This it simply does not have. And elsewhere throughout the book the German perfect equivalent for scientific has been used in translating Scientific Management.

The reviewer also believes that Taylor would not have objected to the use of the term *Rationalizirung* used in Germany to designate much that we in America understand by putting an industry on a Scientific Management basis, though this does not meet with much favor among his followers here. It should be remembered, however, that Taylor often said that most of his system was only pure common sense.

But while in the essentials this little book describes Taylor's work and efforts in an admirably condensed and truthful manner, it does also contain a few inaccuracies which it has been thought best to point out.

The statement that Taylor perfected his system at the works of the Bethlehem Steel Company (page 16) is far from correct. While he, perhaps, left there with all of his ideas well worked out in his own mind, it took several years more before all these ideas were worked out in a fairly satisfactory manner by his associates.

On page 70 the statement is made that Taylor made his first metal cutting experiments on a vertical milling machine (*Vertical Träsmachine*). This is an incorrect translation for a vertical boring and turning mill, the German equivalent of which is also unknown to the reviewer. This error is no doubt due to a lack of familiarity with machine tools on the part of the author. A similar lack of familiarity with complicated mathematical formulae is probably also responsible for the regrettable misrepresentation on page 73 of some of the reviewer's formulae taken from Taylor's "On the Art of Cutting Metals." As the author on page 30 reveals knowledge of the reviewer's supplement to Taylor's "On the Art of Cutting Metals," the reviewer is doubly chagrined that the author did not reproduce some of the earlier and simpler formulae there given, instead of making the unsuccessful attempt to reproduce the very complicated ones from Taylor's book. As stated in that supplement, those complicated formulae have never been made use of in practice.

On page 8 there is an error in stating that Henry R. Towne, Wilfred Lewis, and Carl G. Barth had before Taylor's time gone through the Midvale Steel works. Only Towne preceded Taylor under William Sellers as president, and not at Midvale but at the works of William Sellers & Company. Lewis and Barth were for the greater part of their respective employments under William Sellers at the latter place and contemporary with Taylor.

But the one real blunder in the little book is the statement about William Sellers' fundamental principle of machine design. It is quoted as: "A machine is correct when it is pleasing to the eye." As the reviewer often heard it from Mr. Sellers' own lips, it was: "What is right, looks right." That makes sense, the reverse nonsense.

Finally, the reference made to the strike at the Watertown Arsenal in 1911 is entirely erroneous, though no doubt the author has for this drawn on sources considered authentic. That strike was not brought on when an attempt was made to organize the foundry on the basis of Taylor's fundamental principles, but by an attempt to make a time study on a molder in absolute disregard of one of his most important principles; namely, before any preparatory work had been done (as there had been during two full years in the machine shop where there was no trouble), and without first obtaining that molder's consent and willing co-operation. Hence, so far as the reviewer knows, Taylor's proud statement that there never had been a strike under his system (Scientific Management) is as true today as it was previous to that misrepresented strike at the Watertown Arsenal.

CARL G. BARTH[1]

Organisation Bancaire. By Roger Alheinc, Dunod, Paris, 1928, pages 101.

The author of this work, Roger A. Alheinc, Director de la Banque Nationale Francaise du Commerce Exterieur of Paris, presents the problems of European banks much as Taylor did that of American industry, namely, the performance of more work at less cost and with higher returns to the employe, as well as to management and capital. He pays a tribute to Taylor and also to Bertrand Thompson, who originally stimulated his research in banking.

The author classifies the employes of a bank and makes an analysis of the work of a typical banking department, indicating the various steps taken, for example, in handling a draft. He points out that organization of the work of a bank is necessary in order to obtain rapid execution of the elements of each operation and rapid co-ordination of the results of the operation with the smallest quantity of workers. The author indicates that since there may be an incompatibility between rapid execution and rapid co-ordination, there must of necessity be a better methods department. He points out the necessity of considering the psychological as well as the material conditions of the organization.

M. Alheinc shows how the product of a department or branch may be measured. Comparisons may be made of the volume of one period with that of another. The results, the author points out, of comparative statistics, give information to all those interested in the bank's progress on the basis of which they may find better means of doing the work.

The author suggests analyses to determine just what each individual is doing. He finds it desirable to determine cost price per thousand units of certain kinds of work, and the necessity of ascertaining why the output per day is smaller in some branches than in others. The reasons for this he says may be bad organization of the work, bad methods, unsuitable officers, or inferior employes.

The author feels that in the Head Office, where more employes are devoted to one operation, it may be easier to make comparisons of the adequacy of supervision, distribution of work, the capacity of managers, and of organization and methods.

He describes mechanical devices and asserts that social conflict may be caused by the introduction of machinery unless its purpose is understood. He draws an important distinction between "organization" and the "employment of machines," stating that machines never have solved the problem of organization. He suggests that organization must precede mechanical installation, and that one must go carefully into the types of machines to be used, the cost, and the expected economies. In the transition from the hand to the machine process, it is necessary, he says, to make up a plan for installation, schedule the various steps, issue the instructions required, and have them properly explained, as well as stimulate the imaginations of the clerks as to the value of the new installations. He believes that it is not advisable to reduce personnel until a new method has had a satisfactory trial. M. Alheinc explains the various types of machines and the kinds of work they might be expected to cover. This classification of office machinery is a good one. A formula is suggested to be used in determining the relative merits of a machine as against a hand process, and for the comparison of one machine with another.

The author explains that in order that collective action may be obtained, it would be desirable that each bank establish a methods department; that each country establish a bankers' association; and that internationally a banking section be attached to the International Institute of Management at Geneva. The banking section to be attached to the Institute at Geneva would have the same task as the various associations of banks in each country. This organization would do good work, among other things, in the study of international private credits.

M. Alheinc explains that the methods department of a bank must be managed by men with progressive ideas who understand large organization, and who are under the direction of the Board, and he shows how they should be assisted by several auxiliary departments who would gather statistics, interpret them, analyze the work done, and also make surveys of the condition of prospective borrowers, so as to ascertain their true situation before making loans. The author says in this connection that banks have in the past been satisfied with very superficial examinations based upon insufficient reports and misleading correspondence.

Some of the other duties of methods departments in banks should be, according to M. Alheinc, to institute adequate country collection services, to devise a better means of avoiding fraud, to propagate better management, and to enlighten all parties interested as to costs. It might be better, the author observes, to reduce costs rather than to make agreements as to commissions, which are often not adhered to anyway.

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[1] Consulting Engineer (retired).

M. Alheinc points out finally that while the establishment of methods departments in factories is a big job, it is not so large a job in banks, as most of the data necessary are already available on the records of the bank. The author feels that it is astounding that the methods discussed have been so satisfactorily introduced in industry, and yet are missing in banks, which are based upon bookkeeping. He concludes that France and all of Europe have lost economic equilibrium on account of the War and have to forge ahead with progress in order not to become financially dependent upon America.

This is an exceedingly interesting and valuable piece of work, and it indicates that some of the French bankers are giving as much, if not more, thought than are many American bankers to the problem of bank management and economical operation. The work should have a very stimulating effect in Europe and, indeed, on this side of the Atlantic.

ARTHUR K. SCHULZ[2]

Whither Mankind. A Panorama of Modern Civilization. Edited by Charles A. Beard, Longmans, Green & Co., New York, 1928, pages vii, 408.

Our Economic Morality. By Harry F. Ward, The Macmillan Company, New York, 1929, pages ix, 329.

"Anxiety about the values and future of civilization has crept out of the cloister and appears in the forum and the market place." With this theme sentence Dr. Beard has assembled a prominent group of thinkers to consider with him what the values and future of mankind are, as reflected in its typical activities, among which business figures prominently. To progress or not to progress, that is the question. And unlike numerous pessimists about the influence of machines on life, these writers in the main agree that progress is possible, that values are real and potent, that mankind has its destinies measurably in its own hands.

Perhaps the most unique contribution to this discussion is supplied by the Chinese philosopher who is comparing oriental and western objectives and accomplishments. Unlike many writers, this Oriental concludes a finely balanced statement with the view that "materialistic" is a word to stigmatize the backward eastern civilizations rather than the western. "For to me that civilization is materialistic which is limited by matter and incapable of transcending it; which feels itself powerless against its materialistic environment and fails to make the full use of human intelligence for conquest of nature and for the improvement of the conditions of man." And Mr. Shih therefore decides that pre-eminently in the west it is "only through conscious and deliberate endeavors in the direction of fully realizing" its truly spiritual potentialities that progress will come.

This note of "conscious and deliberate endeavors" toward control dominates the book and gives it a positive and creative challenge far from pessimistic, although certainly not superficially optimistic. It is a provocative volume for business readers with any interest in the meaning of economic activity and in its relative place in the sun. It is a corrective book, correcting dull narrow views of what industry is about and enlarging any limited vision of what life in the large may hold. It is a modern study in evaluation of the working-hour concerns of you and me, which is as heartening as it is stimulating. Business no less that the arts needs this book. It is only a pity that the chapter on the important subject of religion should not have been written by a younger, less dogmatic prophet. To ask James Harvey Robinson to characterize religion is like asking the president of the American Medical Association to contribute his views on Christian Science! But on the whole, the book should emphasize a view of life and industry which needs to be captured by many of us who are so close to the whirring machinery that we never think what we shall do with our increasing volume of goods.

Similar in one respect to Dr. Beard's symposium is Dr. Ward's attack on our economic morality. He, too, insists that capitalism faces a dilemma of further stress on mere production or of forwarding "a process that can get the full values from the machine," by the extension of good-will and human solidarity. This author's major concern is to see how the facts and policies of modern business square themselves with the ethics of Jesus. He writes as an avowed Christian socialist who is naturally sick at heart and full of righteous indignation about economic inequalities and injustices. No reader with broad sympathies but will share many of his feelings of discouragement.

The difficulty, it seems to me, lies rather with his view of the means whereby improvements can be effected. His point of view takes on special importance because the author is a professor in one of our leading theological schools, and, to me at least, it is disconcerting to think of numerous young ministers, unacquainted with the realities of industrial life, being indoctrinated with the absolutistic and almost cataclysmic view of progress which Dr. Ward presents. He insists on seeing life and life processes in black and white, in good or bad, in deliberate altruism or calculated selfishness. He seems to have escaped completely from the influence of modern ideas and facts about "emergent evolution," about growth, about the inner nature of social change. His outlook —and it is one by no means unique with him—is pinioned in water-tight categories.

But human motives, even those of the individuals or groups in positions of economic power, are mixed. Human gains, even when not deliberately sought, are often general and widespread in the benefits which accrue. For every instance of economic selfishness can be cited one of economic stupidity or genuine bewilderment in the face of economic forces of staggering complexity. Our failure to get on is far from being due exclusively to willful perversities of our nature.

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Personally, from the point of view of any tenable modern ethics as illuminated by psychology, I cannot see how we can do other than take a melioristic position of helping forward the instances of intelligence in control and good-will in management, the proposals for sane legislative rules and careful regulation of stupid, cruel or recessive activities in industry, the experiments in progressively democratic operation of companies, and the like. The whole "either-or" philosophy applied to present economic processes is at bottom a flight from reality. It unconsciously represents impatience with the necessary educational means because of fixation on a static and in fact not very explicit end. It grows out of a disastrous confusion between the use in action of purposes of intelligent good-will and the cherishing in a mental compartment of notions of a millennium which give rise not to opportunistic and concrete efforts toward change but to peevishness and downheartedness that things are so far discrepant from what they should be.

I dwell on this contrast of outlooks regarding the emergence of a better economic day because on every hand and especially among the younger radicals, the enfeebling doctrine of "capitalism versus socialism," "evolution or revolution," "profiteering or industry for service," is so widely entrenched. And it is enfeebling to the will to act because it seems to leave so few places where one can start to help along the processes of change. The place of exhortation must not be forgotten. But for every exhorter to "repent ye," we need a dozen willing and enlightened men of affairs active in the economic arena itself, who are controlled in their daily decisions by purposes of democratic growth, personal enhancement and widely distributed purchasing power. More men with such purposes are at work in business today than formerly and more are coming. Writers like Dr. Ward have to be taken seriously because their influence on a new generation of leaders may possibly be helping to develop blind leaders of the blind.

The need, of course, is not for less introduction of what may reasonably be called a religious view of life. With that no one need quarrel. But what methods of change or schemes of social organization, if any, Jesus advocated is a thorny problem. Certainly, the underlying drift of his teaching as a whole would seem to be as consistent with the melioristic attitude as with the revolutionary one, as far as processes are concerned. If the long-time result of a progressive application of good-will to economic life is an economic structure quite unlike that of today, that is a matter for the future to reveal.

Ordway Tead[3]

Significant Paragraphs from Progress and Poverty by Henry George. Selected and compiled by Harry Gunnison Brown, Doubleday, Doran & Company, Garden City, 1928, pages x, 80.

This is a much condensed presentation of the original, showing that it is not machinery, capital, big factories, big business, trusts, wicked employers, unions, banks, monopoly of credit, etc., etc., that, either singly or collectively, cause the great inequalities in the distribution of wealth that we see all over the civilized world, with its accompanying unemployment, child labor, slums, etc.; but, instead, it is the fact that society sanctions and upholds the legal right of some men to charge others ground rent, or a purchase price (capitalized rent), "all the traffic will bear," for the privilege of using the earth's resources—the common heritage of all human beings.

But it is recognized that security of exclusive possession of land is vital to our present form of civilized life. The plan presented is, therefore, that all things produced by labor, either of hand or brain, are to be owned absolutely by those who produce them or have derived title from the producers. None of such things are to be, even in part, taken away from their producers or owners by taxation. The present practice of fining, by taxes, those who make or own useful and desirable things will be abandoned; no tax returns will be required. Instead of the present vexatious, hampering and perjury-provoking system, governments will take for the needs of the commonwealth the entire site value of all lands, exclusive of improvements. This site value for use is, of course, absent from lands not needed and not used but begins with human occupancy and rises with the growth and activity of population. It is much higher in cities and in the case of mineral lands, water-power sites, etc., than elsewhere. Thus progress and development could not be hindered by owners holding land out of use for speculative purposes and no one could compel others to pay a price for access to the earth's resources, or for the privilege of working to produce things needed or desirable for use.

Deeds to land would be held as now and bought and sold as now; but, the only values conveyed by them would be the values of attached improvements produced by human labor. The value of a used piece of land would be taken annually; not as a tax but as ground rent, created by the presence of the community, and therefore its natural source of revenue.

Only a few hours of time are needed to read this book and its clarifying effect as to the nature, incidence and effects of taxation and of the real basis for our claim to the right of life, liberty and the pursuit of happiness is very stimulating for those who will do a little thinking and are puzzled and plagued by our present human problems.

Fred J. Miller[4]

Psychology for Executives. By Elliott Dunlap Smith, Harper & Brothers, New York, 1928, pages xii, 262.

This book is a time saver. The up-to-date executive can hardly afford to be without authoritative knowledge of the fundamentals of individual and group psychology. There are here summarized and interpreted for him, in one volume, the pertinent essentials from a score of authorities.

This book is also exceedingly useful. Having been written by a scholar who was also an operating executive in a humane and enlightened industrial organization, it interprets basic principles in the light of practical experience and actual incidents. Many of the underlying essentials in all successful industrial relations are thus thrown into clear relief.

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No attempt is made to set up specific techniques such as those for employe representation plans or psychological tests. These have their own special literature. The subject matter here is pervasive.

Mr. Smith outlines for us first the groundwork of human behavior in "Why Men Are What They Are," "Habits and How to Handle Them," "Habits and Thought," "The Forces of the Personality." In this he traces various inborn individual differences and the modifying effect of habit formation. Conscious habit training is emphasized. He shows how the executive has a considerable influence on the development of the forces within an individual in industry, both through his method of teaching and his method of handling employes. In the chapter on "The Problem of Self-Control" there are outlined some of the troubles which these forces are apt to cause us personally and in our industrial relationship, together with remedies applicable by the executive.

Some of the more urgent and spectacular problems of industry undoubtedly have their keys in a better understanding of group psychology. Mr. Smith accordingly treats "The Effect of the Group in Industry," and as a last chapter, "The Integration of Conflict." These are excellent presentations of a difficult subject, whose ramifications are too extensive for a brief review. It may be mentioned that both here and elsewhere in the book much light is thrown on incentives, both group and individual.

In two appendices are found "Suggestions for Studying and Teaching Practical Psychology" and "Good Books on Psychology."

The book is carefully written and shows broad grasp and clear insight. No executive can read it without having a better understanding of himself as well as of his opportunities for bringing about more effective industrial relationships.

E. Hayden Hull[5]

Earnings and Working Opportunity in the Upholstery Weavers' Trade in 25 Plants in Philadelphia. By Anne Bezanson, University of Pennsylvania Press, Philadelphia, 1928, pages xix, 131.

This study is in essence a statistical inquiry into the economic status of the employes of a group of selected plants in a specialized industry.

The entire study has been based upon the primary statistics made available by the records kept by the individual workmen themselves. The weavers were requested to record their earnings and working time weekly. These records were forwarded to the secretary of the local union and then to the people in charge of the statistical study. The entire membership of the union was interested in this inquiry. The tabulation of the card records was undertaken by the Industrial Research Department of the University of Pennsylvania.

There are about two thousand weavers in the Philadelphia upholstery industry working in establishments small enough for the work of the individual to be noted and known. It is an industry in which the workers know each other; in which the factors affecting the industry are matters of study and of debate.

In skill the workers in this industry rank at the top of textile weavers. The struggle to maintain tapestry weaving as an art has been a factor in maintaining a one-man-one-loom rule in the industry. This rule applies to all fabrics whether damasks, light curtains, upholstery goods, pictorial tapestries, or extreme novelties are woven. Whatever its justification in the industry, the discussion of earnings is simplified by the existence of this one-man-one-loom rule. In every case, whatever the fabric, the figures of earnings are for work done upon one loom.

The hourly rates are not computed for a single week, but instead over a two-year period. During both years significant differences are found in earnings from plant to plant. The findings show the complexity of interpreting wage data even in a reasonably well defined occupation. By classifying these plants into three groups and comparing the distribution within these groups one can give a summary figure closer than the average of the industry to prevailing earnings within each group. During neither 1926 nor 1927 is there a tendency to uniformity in the median rates at the various plants. There is, however, a tendency for plants low one year to be equally low the next year.

The study made of weekly earnings and the effect of fluctuations in working time shows that in 1926 the highest rate mills in respect to hourly earnings maintained their rank and were also highest in weekly earnings, but that one-half of those in the lower third of the hourly scale offset their low rates sufficiently to attain middle rank in regard to weekly earnings.

The annual earnings show that there was only a small percentage in the two groups of highest rate earning less than $1,500. In the lowest rate mills, 16.6 per cent in 1928 and 12.8 per cent in 1927 earned less than $1,500. If a summary figure of annual earnings for these mills can be given it would be somewhere between $1,760 and $2,070 depending upon the rank and working time of the group of mills considered.

While there has been much discussion of labor turnover in management literature little is known of the effect of changes in employment on the individual worker. This study deals with the movement within the same occupation. It goes further and shows earnings at the plants the employes left as well as earnings at their new plants. By studying earnings at both plants, an indication is found as to whether the low earnings are characteristic of the same group at all plants or whether the employe can improve his earnings by working in a shop in which average earnings are high. The net advantages to the workmen of intermill changes in 1926 are given.

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